# Endangered Species Act — Section 7 Consultation
# Biological Opinion

Bering Sea and Aleutian Islands Management Area (BSAI)
Groundfish Fishery
Exempted Fishing Permit
Authority: 50 CFR 600.745(b) and 50 CFR 679.6
PERMIT #06-01

Lead Action Agency: National Marine Fisheries Service

Consultation
Conducted by: National Marine Fisheries Service
Alaska Region

Date Issued: March 9, 2006

Issued by: Robert D. Mecum

Robert D. Mecum
Acting Regional Administrator

## TABLE OF CONTENTS

# INTRODUCTION

The biological opinion (Opinion) and incidental take statement of this consultation were prepared by the National Marine Fisheries Service in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531, et seq.), and implementing regulations at 50 CFR 402. With respect to critical habitat, the following analysis relies only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

## Background and Consultation History

On January 7, 2006, the National Marine Fisheries Service (NMFS) Protected Resources Division (PRD) received a written request for ESA section 7 formal consultation from the NMFS Sustainable Fisheries Division (SFD). The SFD proposes to issue an exempted fishing permit (EFP) to support a feasibility study using commercial fishing vessels for acoustic surveys of pollock in the Aleutian Islands subarea. SFD is proposing this action according to its authority under 50 CFR 600.745 and 679.6. Formal consultation was initiated on January 17, 2006.

The project involves the harvest of pollock inside designated critical habitat. This harvest is necessary to verify acoustic data collected during acoustic surveys using a fishing vessel under an experimental fishing permit. The SFD has determined that the project "may affect, and is likely to adversely affect" the western distinct population segment (population) of Steller sea lion (*Eumetopias jubatus*) and its designated critical habitat. The January 2006 environmental assessment (NMFS 2006) for the proposed action is hereby incorporated by reference into this Opinion as it provides a substantial review of the proposed action.

## Proposed Action

The exempted fishing permit (EFP) would support a project to test the feasibility of using commercial fishing vessels for acoustic surveys of pollock in the Aleutian Islands. The information collected may improve the information available for stock assessments and may result in improved management of pollock harvest.

The EFP is necessary to allow the applicant to fish for pollock in the study area, inside critical habitat which is normally closed to pollock fishing. Pollock fishing is necessary to verify acoustic sign and financially support the survey effort. Exemption from portions of the closure areas at Kanaga Sound (Figure 1) and Atka Island (Figure 2) are necessary to ensure the participants encounter enough pollock to test the feasibility of acoustic survey work with commercial vessels in the Aleutian Islands subarea. The EFP is needed only for the third phases of the project because no exemptions from fishery regulations at 50 CFR part 679 are needed for the sonar self-noise test under Phase 1 or the opportunistic acoustic survey under Phase 2. The time period of the project is March 1, 2006 through April 30, 2006, with the possibility of modifying the permit for an extension up to 12 months to complete the work.

The purpose of issuing the EFP is to test the feasibility of using commercial fishing vessels to conduct acoustic surveys for pollock in the Aleutian Islands subarea. NMFS currently does not have resources to conduct acoustic surveys of pollock in the Aleutian Islands subarea. The acoustic and biological information from the project will be used to determine; 1) if it is feasible to conduct acoustic surveys in the Aleutian Islands subarea using commercial fishing vessels, 2) if the data collected in such a manner is of sufficient quality for management purposes, and 3) if the local aggregations of pollock are stable enough during spawning season to allow for fine scale spatial and temporal management. Additionally, genetic samples will be collected during this study that will be used for stock structure analysis. Improved information may lead to improved conservation and potentially finer spatial and temporal harvest management of the Aleutian Islands subarea pollock. Improved harvest management of the Aleutian Islands pollock stock is needed based on the high uncertainty in the stock structure and the potential effects of the fishery on Steller sea lion populations.

Appendix A of NMFS (2006), contains the cruise plan for the project which is a detailed description of the work to be performed under the EFP. The project has three phases:
(1) evaluating the commercial fishing vessels appropriateness as an acoustic sampling platform, (2) opportunistically collecting acoustic data of pollock distribution around two sites, Kanaga Sound (Figure 1) and Atka Island (Figure 2), and (3) direct acoustic and biological data sampling at one of the study sites (up to 10 one to three day trips). To verify the acoustic data and to support the study, 1000 mt of walleye pollock would be harvested within an area that includes waters within 20 nautical miles (nm) to 0 nm of Steller sea lion haulouts and rookeries. Conducting the project within Steller sea lion critical habitat (Figure 3) is necessary because pollock aggregations must be encountered to support the work, and historical information about the occurrence of pollock indicates that pollock aggregations are likely to occur inside critical habitat. As seen in the 2005 pollock fishery, it may be difficult to conduct the project outside of critical habitat because of the difficulty in finding sufficient quantities of pollock.

**Action Area**

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02(d)). The Project area for the acoustic survey and supporting fishing will take place in one of two areas of the Aleutian Islands Subarea, Kanaga Sound (Figure 1) or Atka Island (Figure 2). One of the study areas would be used for conducting acoustic surveys and verification fishing of the survey data, and commercial fishing to compensate for survey expenses. The areas identified include waters within designated Steller sea lion critical habitat (Figure 3). The EFP would permit one vessel to harvest the verification and compensation fish (mostly pollock) over approximately three weeks in March. Fishing activities would include State waters which require permission from the Alaska Department of Fish and Game (ADF&G).

The Kanaga Sound site is waters within the study area delineated by a box with the northern boundary of 52° 15' latitude and a southern boundary of 51° 43' latitude from Adak Island to the eastern shore of Tanaga Island. The eastern boundary is 176° 45' longitude W and the western boundary is 178° 15' longitude W south to 51° 52' N latitude. The southern boundary of this portion of the box on the west side of Tanaga Island is at 51° 52' N latitude between 178° 15' longitude W and 178° 13' 22" longitude W (Figure 1). This area is located within statistical area 542 of the BSAI.

The Atka Island site is waters north of Atka and Amlia Island between 173°30' W longitude and 175°15' W longitude and south of 52°45' N latitude. At Amlia pass, the area includes waters north of a line at 52 deg. 7' 30" North latitude between 174 deg. 3' W longitude and 174deg. 5' 1" W longitude (Figure 2). This area is located in statistical area 541 of the BSAI.

Most activities associated with the action occur within the Project area (Kanaga Sound and Atka Island). NMFS has determined that the entire area encompassed by these two areas as described above is likely to be directly or indirectly affected by the proposed action. NMFS recognizes that listed species and their prey move in and out of these areas. In particular, Steller sea lions likely travel between these two areas and other nearby haulouts and foraging areas. Thus direct and indirect impacts to individuals as a result of the action may be carried with them when they are not in the action areas. Further, prey resources (e.g. pollock) move throughout larger areas especially during the winter during spawning season. For the purpose of this consultation the action area includes all waters within the exclusive economic zone (EEZ) within the Central Aleutian Islands area (CAI) as defined by Steller sea lion survey areas (from Samalga Pass to Kiska Island; see Figure 4).

The action area is used by the western population of Steller sea lions for foraging, migration, hauling out, and reproduction. The action area includes Steller sea lion critical habitat as defined at 50 CFR 226.202 (Figure 3).

## BIOLOGICAL OPINION

The ESA establishes a national program to conserve threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Section 7(b)(4) requires the provision of an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

This Opinion presents NMFS' review of the status of the western population of Steller sea lion, the condition of designated critical habitat, the environmental baseline for the action area, all the effects of the action as proposed, and cumulative effects (50 CFR 402.14(g)). For the jeopardy analysis, NMFS analyzes those combined factors to conclude whether the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

The critical habitat analysis determines whether the proposed action will destroy or adversely modify designated critical habitat for listed species by examining any change in the conservation value of the essential features of that critical habitat. This analysis relies on statutory provisions of the ESA, including those in section 3 that define "critical habitat" and "conservation," in section 4 that describe the designation process, and in section 7 that sets forth the substantive protections and procedural aspects of consultation. The regulatory definition of "destruction or adverse modification" at 50 CFR 402.02 is not used in this Opinion.

### Status of Listed Resources

NMFS has determined that the action being considered in the Opinion may adversely affect the western population of Steller sea lion and its designated critical habitat.

#### Steller sea lion – western population

***Species description:*** The Steller sea lion (*Eumetopias jubatus*) is the only species of the genus *Eumetopias*, and is a member of the family Otariidae, order Pinnipedia. The closest relatives of the Steller sea lion appear to be the other sea lion genera, including *Zalophus*, *Otaria*, *Neophoca*, and *Phocarctos,* and fur seals of the genera *Callorhinus* (Northern fur seals) and *Arctocephalus*. Loughlin et al. (1987) provide a brief but informative summary of the fossil record for *Eumetopias*. Repenning (1976) suggests that a femur dated three to four million years old may have been from an ancient member of the *Eumetopias* genus, thereby indicating that the genus is at least that old. *Eumetopias jubatus* likely evolved in the North Pacific (Repenning 1976).

***Reason for Listing:*** Due to a significant decline in total numbers of 64% over a 30-year period, NMFS issued an emergency rule, on November 26, 1990, listing the Steller sea lion as threatened under the ESA (55 FR 40204). On August 27, 1993 (58 FR 45269) critical habitat was designated based on observed movement patterns. In 1997 the Steller sea lion population was split into two distinct population segments (western and eastern populations) based on demographic and genetic dissimilarities (Bickham et al. 1996, Loughlin 1997) (62 FR 30772). Population Viability Analysis (PVA) models indicated a continued decline at the 1985-1994 rate would result in extinction of the western population in 100 years or a 65% chance of extinction if the 1989-1994 trend continued (62 FR 24354), therefore the status of the western population was changed to endangered. Although increasing in numbers, the eastern population remained listed as threatened because NMFS believed that the large decline in the overall U.S. population threatened the continued existence of the entire species (62 FR 24354).

***Status and trend:***

Overview: The western population of Steller sea lions decreased from an estimated 245,000-290,000 animals in the late 1970s to less than 50,000 in 2000 (Table 1). The decline began in the 1970s in the eastern Aleutian Islands (Braham et al. 1980), western Bering Sea/Kamchatka and the Kuril Islands (Table 3). In Alaska, the decline spread and intensified east and west of the eastern Aleutians in the 1980s, and persisted at a slower rate through 2000 (Sease et al. 2001). The 12% increase in numbers of non-pups counted in the Alaskan range of the western population between 2000 and 2004 was the first region-wide increase observed during more than two decades of systematic surveys. The observed increase, however, has not been spread evenly among all regions of Alaska. Increases were noted in the eastern and western Gulf of Alaska, and in the eastern and central Aleutian Islands, while the decline persisted through 2004 in the central Gulf of Alaska and the western Aleutian Islands. Non-pup counts at all western-stock trend sites in Alaska in 2004 were similar to the 1998 total, but were still 33% lower than the number counted in 1990 (Table 1). In Russia, both pup and non-pup data indicate that sea lion numbers are increasing at Sakhalin Island and in the Sea of Okhotsk and likely at the Commander Islands (Table 3). However, non-pup numbers in Kamchatka and the Kuril Islands, the former core of the Russian range, declined substantially through the late 1980s, but have increased slightly through 2005. The number of western Steller sea lions throughout its range in Alaska and Russia in 2005 is estimated at approximately 60,000 (44,800 in Alaska, and 16,000 in Russia).

Steller sea lions use 38 rookeries and hundreds of haul-out sites within the range of the western population in Alaska (Figures 3 and 4). The first reported counts of Steller sea lions in Alaska were made in 1956-1960 (Kenyon and Rice 1961, Mathisen and Lopp 1963), and these totaled approximately 140,000 for the Gulf of Alaska (GOA) and Aleutian Islands (AI) regions (Merrick et al. 1987). Subsequent surveys showed a major decline in numbers first detected in the eastern AI in the mid-1970s (Braham et al. 1980). The decline spread eastward to the central GOA during the late 1970s and early 1980s and westward to the central and western AI during the early and mid 1980s (Merrick et al. 1987, Byrd 1989). Approximately 110,000 adult and juvenile sea lions were counted in the Kenai-Kiska region in 1976-1979, and by 1985 and 1989, counts had dropped to about 68,000 (Merrick et al. 1987) and 25,000 (Loughlin et al. 1990), respectively. Since 1990 when Steller sea lions were listed under the ESA, complete surveys have been conducted throughout their range in Alaska every 1 or 2 years (Merrick et al.

1991, 1992, Sease et al. 1993, 1999, 2001, Strick et al. 1997, Sease and Loughlin 1999, Sease and Gudmundson 2002, Fritz and Stinchcomb 2005).

Between the late 1950s and the mid 1970s, sea lion populations in parts of the Alaskan range of the western stock may have begun to drop (Table 1). From the mid-1970s to 1990 the overall western population in Alaska declined by over 70%, with the largest declines in the AI (76% to 84%) and smaller declines in the GOA (23% to 71%; Table 1). Between 1990 and 2000, trend site counts continued to decline, though more slowly than in the 1980s, resulting in total reduction of almost 90% since the 1950s and 83% since the 1970s. Sub-area declines from 1990 to 2000 had a different pattern than in the 1970s-1990 period, with smaller changes in the center of the Alaskan range (western GOA and eastern and central Aleutians: -32% to +1%) and larger declines at the edges (eastern and central GOA and western Aleutians: -54% to –64%). The average rate of decline between 1990 and 2000 for all trend sites in the western population was 5.1% per year (Sease et al. 2001).

Between 2000 and 2004, Kenai-Kiska and western Alaska population trend site counts of non-pup Steller sea lions increased by 12% (Table 1; Figure 6; Fritz and Stinchcomb 2005). Increases were not spread evenly across the range in Alaska, however. Non-pup counts increased by over 20% in the eastern Aleutian Islands and in the eastern and western GOA, and by 10% in the central Aleutian Islands (Table 5), but were lower by as much as 16% in the central GOA and western Aleutians (Table 1; Figure 7). While overall non-pup counts from 2000 to 2004 increased, counts in the western GOA and eastern AI had essentially no trend between 1990 and 2004, suggesting that western Steller sea lions in the core of their Alaskan range may currently be oscillating around a new lower mean level.

Using the methods described in Loughlin et al. (1992), Loughlin (1997) estimated that the non-pup U.S. western population totaled approximately 177,000 in the 1960s; 149,000 in the 1970s; 102,000 in 1985; 51,500 in 1989; and only 33,600 in 1994. Using similar methods, Loughlin and York (2000) estimated the number of non-pups in the U.S. western population in 2000 at about 33,000 animals. Using a different method, Ferrero et al. (2000) and Angliss and Lodge (2004) estimated the minimum abundance of the western U.S. population in 1998 at 39,031 and in 2001-2004 at 38,206, respectively, a decline of over 80% since the late 1970s.

Pups have been counted less frequently than non-pups, but the overall trends since the late 1970s have been similar to counts of non-pups (Table 2). The number of pups counted in the Kenai-Kiska region declined by 70% from the mid-1980s to 1994, with large declines (63% to 81%) in each of the four sub-areas. From 1994 to 2001-02, Kenai-Kiska pup counts decreased another 19%, with the largest change (-39%) observed in the central GOA. The overall decline in the number of pups in the Kenai-Kiska region from the mid-1980s through 2002 was 76%. Pup counts in the eastern GOA (not included in the Kenai-Kiska region) declined by 35% from 1994 to 2002, while in the western Aleutian Islands, pup counts declined by 50% between 1997 and 2002 (Table 2). Between 2001-02 and 2005, increases in pup counts were noted in the eastern and western GOA and eastern AI, while pup counts declined in the central GOA and central and western AI. In June-July 2005, a medium format aerial survey for pups was conducted from Prince William Sound to Attu Island, which provided the first complete pup count for all western stock rookeries in Alaska (n = 9,951 pups; NMML, unpublished). Using the 'pup' estimator (4.5) yields and estimate of approximately 44,800 Steller sea lions in the range of the western stock in Alaska (Calkins and Pitcher 1982).

Steller sea lions use 10 rookeries and approximately 77 haul-out sites within the range of the western population in Russia (Figure 4). Of these 77 haul-outs, three had been rookeries but presently no breeding occurs there, 49 are active haul-out sites, 20 have been abandoned (no sea lions seen there for the past 5-10 years), and five have inadequate information to assess their status. Analysis of available data collected in the former Soviet Union indicates that in the 1960s, the Steller sea lion population totaled about 27,000 (including pups), most of which were in the Kuril Islands (Tables 3 and 4). Between 1969 and 1989, numbers of adult and juvenile sea lions at major rookeries and haul-outs in the Kuril Islands alone declined 74% (Merrick et al. 1990). By the late 1980s and early 1990s, the total Russian population had declined by approximately 50% to about 13,000 (including pups) (Burkanov and Loughlin 2006). Since the early 1990s, the population has increased in most areas, and in 2005, is estimated to number approximately 16,000 (including pups)(Burkanov and Loughlin 2006).

Modeling studies based primarily on data collected in the central GOA indicate that the decline experienced by the western sea lion population in Alaska in the 1980s was largely caused by a steep drop in the survival rate of juveniles, perhaps by as much as 20-30% (York 1994, Pascual and Adkison 1994, Holmes and York 2003). However, the decline at this time was also associated with smaller decreases in adult survival and female fecundity (Holmes and York 2003). The drop in fecundity would not have been predicted based on density-dependence alone. Subsequent to the 1980s, demographic models indicate that juvenile and adult survival rates rebounded to levels similar to those of the 1970s, stable equilibrium population, but that fecundity continued to decline (Holmes and York 2003).

***Survival and reproduction:*** Changes in the size of a population are ultimately due to changes in one or more of its vital demographic rates. Inputs to the population are provided by reproduction of adults (e.g., birth rates, natality, fecundity; probability that a female of a given age will give birth to a pup each year) and immigration. Outputs from the population include those that leave the population through emigration or death, which can also be inversely described by rates of adult and juvenile survivorship. Estimates of vital rates are best determined in longitudinal studies of marked animals, but can also be estimated through population models fit to time series of counts of sea lions at different ages or stages (e.g., pups, non-pups).

Causes of pup mortality are numerous and include drowning, starvation caused by separation from the mother, disease, parasitism, predation, crushing by larger animals, biting by other sea lions, and complications during parturition (Orr and Poulter 1967; Edie 1977, Maniscalco and Atkinson 2004, ADF&G and NMFS unpublished data). Older animals may die from starvation, injuries, disease, predation, subsistence harvests, intentional shooting by humans, entanglement in marine debris, and fishery interactions (Merrick et al. 1987).

Calkins and Pitcher (1982) estimated mortality rates using life tables constructed from samples collected in the Gulf of Alaska in 1975-1978. The estimated overall mortality from birth to age 3 was 0.53 for females and 0.74 for males; i.e., 47% of females and 26% of males survived the first 3 years of life. Annual mortality rate decreased from 0.132 for females 3-4 years of age, to 0.121 for females 4-5 years old, to 0.112 for females 5-6 years old, and to 0.11 by the seventh year; it remained at about that level in older age classes. Male mortality rates decreased from 0.14 in the third year to 0.12 in the fifth year. Females may live to 30 years-old and males to about 20 (Calkins and Pitcher 1982).

York (1994) produced a revised life table for female Steller sea lions using the same data as Calkins and Pitcher (1982) but a different model. The estimated annual mortality from York's life table was 0.22 for ages 0-2, dropping to 0.07 at age 3, then increasing gradually to 0.15 by age 10 and 0.20 by age 20. Population modeling suggested that decreased juvenile survival likely played a major role in the decline of sea lions in the central Gulf of Alaska during 1975-1985

(Pascual and Adkison 1994;York 1994; Holmes and York 2003). This is supported by field observations on two major rookeries in the western population. The proportion of juvenile sea lions counted at Ugamak Island was much lower in 1985 and 1986 than during the 1970s, suggesting that the mortality of pups/juveniles increased between the two periods (Merrick et al. 1988). A decline in the proportion of juvenile animals also occurred at Marmot Island during the period 1979-1994. A very low resighting rate for pups marked at Marmot Island in 1987 and 1988 suggested that the change in proportions of age classes was due to a high rate of juvenile mortality (Chumbley et al. 1997).

Detailed information on Steller sea lion reproduction has been obtained from examinations of reproductive tracts of dead animals. These studies have shown that female Steller sea lions reach sexual maturity at 3-6 years of age and may produce young into their early 20s (Mathisen et al. 1962; Pitcher and Calkins 1981). Adult females normally ovulate once each year, and most breed annually (Pitcher and Calkins 1981). Males reach sexual maturity between 3 and 7 years of age and physical maturity by age 10 (Perlov 1971; Pitcher and Calkins 1981). Males are territorial during the breeding season, and one male may breed with several females. Thorsteinson and Lensink (1962) found that 90% of males holding territories on rookeries in the western Gulf of Alaska were between 9 and 13 years of age while Raum-Suryan et al.(2002) found that males marked on Marmot Island as pups first became territorial at 10 and 11 years of age.

In samples collected in the Gulf of Alaska in the mid-1980s, Calkins and Goodwin (1988) found that 97% of females aged 6 years and older had ovulated. Ninety-two percent of females 7-20 years old were pregnant when they were collected in October during early implantation. The pregnancy rate of sexually mature females collected during April-May (late gestation) was only 60%, indicating that a considerable amount of intrauterine mortality and/or premature births occurred after implantation. Estimates of near-term pregnancy rates were 67% from a collection of females taken from 1975-1978 and 55% from a similar collection during the mid-1980s (Pitcher et al., 1998), but the difference was not statistically significant between periods ($P = 0.34$). Examination of reproductive tracts from female Steller sea lions killed near Hokkaido, Japan in 1995-96 showed that the pregnancy rate for females that had ovulated was 88% (23/26) (Ishinazaka and Endo 1999). These samples were collected in January and February so this estimated pregnancy rate was much higher compared to the late-term rates of 55-67% estimated for sea lions from Alaska.

***Habitat use:*** Steller sea lions use a variety of marine and terrestrial habitats. Haulouts and rookeries tend to be preferentially located on exposed rocky shoreline and wave-cut platforms. Some rookeries and haulouts are also located on gravel beaches. Rookeries are nearly exclusively located on offshore islands and reefs. Terrestrial sites used by Steller sea lions tend to be associated with waters that are relatively shallow and well-mixed, with average tidal speeds and less-steep bottom slopes. When not on land, Steller sea lions are seen near shore and out to the edge of the continental shelf and beyond.

Limited data are available concerning the foraging behavior of adult Steller sea lions. Adult females alternate trips to sea to feed with periods on shore when they haul out to rest, care for pups, breed, and avoid aquatic predators. Conversely, territorial males may fast for extended periods during the breeding season when they mostly remain on land (Spalding 1964; Gentry 1970; Withrow 1982; Gisiner 1985). Females with dependent young are constrained to feeding relatively close to rookeries and haulouts because they must return at regular intervals to feed their offspring.

Telemetry studies show that in winter adult females may travel far out to sea into water greater than 1,000 m deep (Merrick and Loughlin 1997) and juveniles less than 3 years of age travel nearly as far (Loughlin et al. 2003). The Platforms of Opportunity data base maintained by NMFS shows that they commonly occur near and beyond the 200 m depth contour (Kajimura and Loughlin 1988; NMFS POP data). Some individuals may enter rivers in pursuit of prey (Jameson and Kenyon 1977). In summer while on breeding rookeries, adult females attending pups tend to stay within 20 nm of the rookery (Calkins 1996; Merrick and Loughlin 1997).

Studies using satellite-linked telemetry have provided detailed information on movements of adult females and juveniles. Merrick and Loughlin (1997) found that adult females tagged at rookeries in the central Gulf of Alaska and Aleutian Islands in summer made short trips to sea (mean distance 17 km, maximum 49 km) and generally stayed on the continental shelf. In winter, adult females ranged more widely (mean distance 133 km, maximum 543 km) with some moving to seamounts far offshore. Most pups, which were tracked during the winter, made relatively short trips to sea (mean distance 30 km), but one moved 320 km from the eastern Aleutians to the Pribilof Islands. Adult females with satellite transmitters in the Kuril Islands in summer made short at-sea movements similar to those seen in Alaska (Loughlin et al. 1998).

Behavioral observations indicate that lactating females spend more time at sea during winter than in the summer. Attendance cycles (consisting of one trip to sea and one visit on land) averaged about 3 days in winter and 2 days in summer (Trites and Porter 2002, Milette and Trites 2003). Time spent on shore between trips to sea averaged about 24 hours in both seasons. The winter attendance cycle of dependent pups and yearlings averaged just over 2 days, suggesting that sea lions do not accompany their mothers on foraging trips (Trites and Porter 2002). Foraging trips by mothers of yearlings were longer on average than those by mothers of pups (Trites and Porter 2002).

Additional studies on immature Steller sea lions indicate three types of movements: long-range trips (greater than 15 km and greater than 20 h), short-range trips (less than 15 km and less than 20 h), and transits to other sites (Raum-Suryan et al. 2004). Long-range trips started around 9 months of age and likely occurred most frequently around the time of weaning while short-range trips happened almost daily (0.9 trips/day, n = 426 trips). Transits began as early as 2.5-3 months of age, occurred more often after 9 months of age, and ranged between 6.5 - 454 km (Raum-Suryan et al. 2004, Loughlin et al. 2003). Some of the transit and short-range trips occur along shore, while long-range trips are often offshore, particularly as ontogenetic changes occur.

Overall, the available data suggest two types of distribution at sea by Steller sea lions: 1) less than 20 km from rookeries and haulout sites for adult females with pups, pups, and juveniles, and 2) much larger areas (greater than 20 km) where these and other animals may range to find optimal foraging conditions once they are no longer tied to rookeries and haulout sites for nursing and reproduction. Loughlin (1993) observed large seasonal differences in foraging ranges that may have been associated with seasonal movements of prey, and Merrick (1995) concluded on the basis of available telemetry data that seasonal changes in home range were related to prey availability.

***Diet:*** Steller sea lions are generalists, feeding on seasonally abundant prey throughout the year. They feed predominately on species that aggregate in schools or for spawning. Prey varies seasonally and geographically. Principal prey species identified from scats include walleye pollock (*Theragra chalcogramma*), Atka mackerel (*Pleurogrammus monopterygius*), Pacific salmon (*Onchorhynchus* sp.) and Pacific cod (*Gadus macrocephalus*) in the western part of the range (Sinclair and Zeppelin 2002). In southeast Alaska, the diet includes walleye pollock, Pacific cod, flatfishes, rockfishes, Pacific herring (*Clupea harengus*), salmon, sand lance, skates, squid, and octopus (Calkins and Goodwin 1988, Trites et al. 2003). Principal prey in British Columbia has included hake, herring, octopus, Pacific cod, rockfish, and salmon (Spalding 1964, Olesiuk et al. 1990). In California and Oregon, rockfish, hake, flatfish, cusk eel, lamprey, other fishes, squid, and octopus have been identified as important prey items (Fiscus and Baines 1966, Jameson and Kenyon 1977, Jones 1981, Treacy 1985). Ephemeral, seasonal prey are also important in local areas, such as the seasonal occurrence of spawning eulachon and Pacific herring in Berners Bay in southeast Alaska that supports up to 7-10% of the southeast Steller sea lion population for about three weeks in April (Sigler et al. 2004, Womble 2005).

Considerable effort has been devoted to describing the diet of Steller sea lions in the Gulf of Alaska, Aleutian Islands, and Bering Sea (Table 6). In the mid 1970s and mid 1980s, Pitcher (1981; n = 250) and Calkins and Goodwin (1988; n = 178) described Steller sea lion diet in the Gulf of Alaska by examining stomach contents of animals collected for scientific studies. Walleye pollock was the principal prey in both studies; octopus, squid, herring, Pacific cod, flatfishes, capelin, and sand lance were also consumed frequently. Stomachs of Steller sea lions collected in the central and western Bering Sea in March-April 1981 contained mostly pollock, and also Pacific cod, herring, sculpins, octopus, and squid (Calkins 1998).

Merrick and Calkins (1996) analyzed Kodiak Island region sea lion stomach contents (n = 263) data from the 1970s and 1980s for seasonal patterns of prey use. They found a significant seasonal difference in diet for the 1970s. Walleye pollock was the most important prey in all seasons except summer in the 1970s, when the most frequently eaten prey type was small forage fishes (capelin, herring, and sand lance). No significant seasonal differences were found in the 1980s. Researchers noted that, overall, small forage fishes and salmon were eaten almost exclusively during summer, while other fishes and cephalopods were eaten more frequently in spring and fall.

Since 1990, additional information on Steller sea lion diet in Alaska has been obtained by analyzing scats collected on rookeries and haulouts (Merrick et al. 1997; NMFS 2000; Sinclair and Zeppelin 2002). Scat data, like stomach contents, may be biased (e.g., prey species may have hard parts that are more or less likely to make it though the digestive tract; see Cottrell and Trites 2002, Tollit et al. 2003, 2004, Zeppelin et al. 2004), but they allow a description of prey used over a wide geographic range from Kodiak Island through the western Aleutian Islands, and for both summer and winter (Table 6). Results confirmed previous studies that showed pollock to be the dominant prey in the Gulf of Alaska and also indicated that Atka mackerel is the most important prey in the central and western Aleutian Islands. Pacific cod has also been an important food, especially in winter in the Gulf of Alaska, while salmon was eaten most frequently during summer months. Results also indicated a wide variation as certain species that appear to be minor dietary items when data are tabulated for large regions may actually be highly ranked prey for specific rookeries and seasons.

At the far western end of the Steller sea lion range, Atka mackerel, sand lance, rockfish, and octopus were identified as important foods at the Kuril Islands in colletions made in 1962 (Panina 1966), and pollock, Pacific cod, saffron cod, cephalopods, and flatfish were the main prey of 62 animals collected near Hokkaido, Japan in 1994 - 1996 (Goto and Shimazaki 1998). NMFS (2000) compiled all the available data on prey occurrence in stomach contents samples for the eastern and western Steller sea lion populations for the 1950s-1970s and the 1980s. For both populations the occurrences of pollock, Pacific cod, and herring were higher in the 1980s than in the 1950s-1970s. These results suggest that the dominance of pollock in the Steller sea lion diet over much of its' range may have changed over time. However, studies completed prior to the mid-1970s had small sample sizes and more limited geographic scope. As such, caution should be exercised when extrapolating from these limited samples to a description of the diet composition of Steller sea lions in the 1950s -1970s.

Stomach contents analysis indicate that Steller sea lions have a mixed diet. Although it is not uncommon to find stomachs that contain only one prey species most collected stomachs contained more than one type of prey (Merrick and Calkins 1996; Calkins 1998). Merrick and Calkins (1996) found that the probability of stomachs containing only pollock was higher for juveniles than for adults, and small forage fish were eaten more frequently by juveniles while flatfish and cephalopods were more frequently eaten by adults.

***Diving behavior:*** Steller sea lions generally feed at shallow depths. The average dive depth for adult females is 21 m but females can dive in excess of 250 m. Average dive depths for pups in Alaska were 7.7 m with a maximum depth up to 252 m and for yearlings, an average depth of 16.6 m and maximum of 288 m (Loughlin et al. 2003). There is often a diel component (vertical migration in the water column between day and night) to their diving that is consistent with foraging on vertically migrating prey such that diving is shallow at night when prey moves to the surface, and deeper during the day when prey is located deeper in the water column (Merrick and Loughlin 1997, Loughlin et al. 2003).

***Resource requirements especially during the winter season:*** Changes in behavior, foraging patterns, distribution, and metabolic or physiological requirements during the Steller sea lion annual cycle are all pertinent to consideration of the potential impact of prey removal by commercial fisheries. Steller sea lions, at least adult females and juveniles, are unlike most marine mammals that store large amounts of fat to allow periods of fasting. Sea lions need more or less continuous access to food resources throughout the year. Nevertheless, the sensitivity of sea lions to competition from fisheries may be higher during certain times of the year. Reproduction likely places a considerable physiological or metabolic burden on adult females throughout their annual cycle. Following birth of a pup, the female must acquire sufficient nutrients and energy to support both herself and her pup. The added demand may persist until the next reproductive season, or longer, and is exaggerated by the rigors and requirements of winter conditions. The metabolic requirements of a female that has given birth and then become pregnant again are increased further to the extent that lactation and pregnancy overlap and the female must support her young-of-the-year, the developing fetus, and herself. And again, she must do so through the winter season when metabolic requirements are likely to be increased by harsh environmental conditions.

Weaned pups may be independent of their mothers, but may not have developed adequate foraging skills. They must learn those skills, and their ability to do so determines, at least in part, whether they will survive to reproductive maturity. This transition to nutritional independence is likely confounded by a number of seasonal factors. Seasonal changes may severely confound foraging conditions and requirements; winter months bring harsher environmental conditions (lower temperatures, rougher sea surface states) and may be accompanied by changing prey concentrations and distributions (Merrick and Loughlin, 1997). Weaned pups' lack of experience may result in greater energetic costs associated with searching for prey. Their smaller size and undeveloped foraging skills may limit the prey available to them, while at the same time, their small size results in relatively greater metabolic and growth requirements.

Other times of the year are also important for Steller sea lions. Preparation for winter may make foraging during the fall more important. Spring is also important as pregnant females will be attempting to maximize their physical condition to increase the likelihood of a large, healthy pup (which may be an important determinant of the subsequent growth and survival of that pup). Similarly, those females that have been nursing a pup for the previous year and are about to give birth may wean the first pup completely, leaving that pup to survive solely on the basis of its own foraging skills. Thus, food availability is surely important year-round, although it may be particularly important for juvenile animals and pregnant-lactating females during the winter.

***Summary of Steller sea lion status:*** As noted, Steller sea lions were first listed as threatened under the ESA in 1990 due to a significant unexplained population decline of 64% over a 30-year period. This listing conveyed that the species was likely to become endangered within the foreseeable future throughout all or a portion of its range. In 1997, the species was separated into western and eastern populations, and the western population was listed as endangered. At the time of this listing, the population was considered to be in danger of extinction in all or a portion of its range. PVA models indicated that the western population would be extinct in 100 years if the population trends at that time remained unchanged.

The U.S. portion of the western population continued to decline through the 1990s at about 5% annually. Since 2000, the population has increased at about 3%, with most portions of the range showing signs of recovery. The increase appears to be driven by increases in juvenile survival while pup production may still be in decline or possibly beginning to stabilize. The increasing trend in the population has only been observed in two surveys and thus must be observed for at least two more surveys before we can affirm that the population is indeed recovering. Because this population still faces substantial threats, and the observed increases are very short compared to the long time period of decline, it is still considered to be at risk of extinction within the next 100 years.

The western population of Steller sea lion sustains some direct mortalities from bycatch in commercial fisheries, subsistence harvest, illegal shootings, and entanglements in fishing gear. These human activities clearly have an adverse affect to individuals in the western population; however, the population-level consequences of these anthropogenic stressors are potentially low compared to competition for prey with commercial fisheries or natural changes in the availability or abundance of prey. Because of the relatively low number of animals (compared to historic observations), the population is considered vulnerable to catastrophic and stochastic events that could result in significant declines, threaten viability, and increase the species' risk of extinction. It is important to note that abundance estimates alone cannot be relied upon as accurate measures of population recovery without a long-term understanding of demographic parameters of the population, variability in the population trends and the effects of natural and anthropogenic stressors on the status of the population.

**Designated critical habitat for Steller sea lions**

On August 27, 1993 NMFS published a final rule to designate critical habitat for the threatened and endangered populations of Steller sea lions (August 27, 1993; 58 FR 45269). The areas designated as critical habitat for the Steller sea lion were determined using the best information available at the time (see regulations at 50 CFR part 226.202). This included information on land use patterns, the extent of foraging trips, and the availability of prey items. Particular attention was paid to life history patterns and the areas where animals haul out to rest, pup, nurse their pups, mate, and molt. Critical habitat areas were finally determined based upon input from NMFS scientists and managers, the Steller Sea Lion Recovery Team, independent marine mammal scientists invited to participate in the discussion, and the public (Figure 3)).

***Physical and biological features of Steller sea lion critical habitat:*** Two kinds of marine habitat were designated as critical. First, areas around rookeries and haulout sites were chosen based on evidence that many foraging trips by lactating adult females in summer may be relatively short (20 km or less; Merrick and Loughlin 1997). Also, mean distances for young-of-the-year in winter may be relatively short (about 30 km; Merrick and Loughlin 1997; Loughlin et al. 2003). These young animals are just learning to feed on their own, and the availability of prey in the vicinity of rookeries and haulout sites must be crucial to their transition to independent feeding after weaning. Similarly, haulouts around rookeries are important for juveniles, because most juveniles are found at haulouts not rookeries. Evidence indicates that decreased juvenile survival may be an important proximate cause of the sea lion decline (York 1994, Chumbley et al. 1997), and that the growth rate of individual young sea lions was depressed in the 1980s. These findings are consistent with the hypothesis that young animals were nutritionally stressed. Furthermore, young animals are almost certainly less efficient foragers and may have relatively greater food requirements, which, again, suggests that they may be more easily limited or affected by reduced prey resources or greater energetic requirements associated with foraging at distant locations. Therefore, the areas around rookeries and haulout sites must contain essential prey resources for at least lactating adult females, young-of-the-year, and juveniles, and those areas were deemed essential to protect.

Second, three aquatic areas were chosen based on 1) at-sea observations indicating that sea lions commonly used these areas for foraging, 2) records of animals killed incidentally in fisheries in the 1980s, 3) knowledge of sea lion prey and their life histories and distributions, and 4) foraging studies. In 1980, Shelikof Strait was identified as a site of extensive spawning aggregations of pollock in winter months. Records of incidental take of sea lions in the pollock fishery in this region provide evidence that Shelikof Strait is an important foraging site (Loughlin and Nelson 1986, Perez and Loughlin 1991). The southeastern Bering Sea north of the Aleutian Islands from Unimak Island past Bogoslof Island to the Islands of Four Mountains is also considered a site that has historically supported a large aggregation of spawning pollock, and is also an area where sighting information and incidental take records support the notion that this is an important foraging area for sea lions (Fiscus and Baines 1966, Kajimura and Loughlin 1988). Finally, large aggregations of Atka mackerel are found in the area around Seguam Pass. These aggregations have supported a fishery since the 1970s and are in close proximity to a major sea lion rookery on Seguam Island and a smaller rookery on Agligadak Island. Atka mackerel are an important prey of sea lions in the central and western Aleutian Islands. Records of incidental take in fisheries also indicate that the Seguam area is important for sea lion foraging (Perez and Loughlin 1991).

The status of critical habitat is best described as the status of the important prey resources contained within those areas. These fishery resources are evaluated annually and that description is contained in the stock assessment and fishery evaluation (SAFE) reports. Barbeaux et al. (2005) is incorporated here by reference and provides the background for discussions in the baseline and effects of the action sections of this document pertaining to the removal of pollock resources from the Aleutian Islands subarea.

## Environmental Baseline

The environmental baseline is an analysis of the effects of past and ongoing human-caused and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. Environmental baselines for biological opinions include past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

NMFS describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of the species within the action area. When the environmental baseline departs from those biological requirements, the adverse effects of a proposed action on the species or its habitat are more likely to jeopardize the listed species or result in destruction or adverse modification of a critical habitat. Western population Steller sea lions reside in or migrate through the action area. Thus, for this action area, the biological requirements for Steller sea lions are the habitat characteristics that support survival, reproduction, and migration.

### Steller sea lion prey in the Action Area

The latest information on Aleutian Islands pollock stock status can be found in the 2005 stock assessment (Barbeaux et al. 2005) and in NMFS (2006). From Barbeaux et al. 2005:

> *Walleye pollock (Theragra chalcogramma) are distributed throughout the Aleutian Islands with concentrations in areas and depths dependent on season. Generally, larger pollock occur in spawning aggregations during February – April. Three stocks of pollock inhabiting three regions in the Bering Sea – Aleutian Islands (BSAI) are identified in the U.S. portion of the BSAI for management purposes. These stocks are: the eastern Bering Sea pollock occupying the eastern Bering Sea shelf from Unimak Pass to the U.S.-Russia Convention line; the Aleutian Islands Region pollock encompassing the Aleutian Islands shelf region from 170°W to the U.S.-Russia Convention line; and the Central Bering Sea—Bogoslof Island pollock. These three management stocks probably have some degree of exchange. The Central Bering Sea—Bogoslof stock is a group that forms a distinct spawning aggregation that has some connection with the deep water region of the Aleutian Basin. In the Russian Exclusive Economic Zone (EEZ), pollock are thought to form two stocks, a western Bering Sea stock centered in the Gulf of Olyutorski, and a northern stock located along the Navarin shelf from 171°E to the U.S.-*

*Russia Convention line. The northern stock is believed to be a mixture of eastern and western Bering Sea pollock with the former predominant. Bailey et al. (1999) present a thorough review of population structure of pollock throughout the north Pacific region. Recent genetic studies using mitochondrial DNA methods have found the largest differences to be between pollock from the eastern and western sides of the north Pacific.*

*Previously, Ianelli et al. (1997) developed a model for Aleutian Islands pollock and concluded that the spatial overlap and the nature of the fisheries precluded a clearly defined "stock" since much of the catch was removed very close to the eastern edge of the region and appeared continuous with catch further to the east. In some years a large portion of the pollock removed in the Aleutian Islands Region was from deep-water regions and appeared to be most aptly assigned as "Basin" pollock. This problem was confirmed in the 2003 Aleutian Islands pollock stock assessment (Barbeaux et al. 2003).*

The time series of pollock biomass in the Aleutian Islands (for two models) is provided in Figure 13. In the late 1990's the biomass was in decline, then after 1999 it began increasing due to better recruitment (Barbeaux et al. 2005). Issues of stock structure are thoroughly described in the assessment, with two major points: (1) generally, the near shore biomass of pollock (critical habitat) is a different stock than the offshore biomass of pollock found off the continental shelf break, and (2) the stock assessment authors did not consider biomass east of 174$^{o}$ W because it is likely that biomass is likely part of the Bogoslof population or is linked to it in some way that is not well understood.

**Steller sea lion prey use in the Action Area**

Our knowledge of Steller sea lion prey use is largely through the collection and analysis of scat samples (Sinclair and Zeppelin 2002; NMFS unpublished data). Sinclair and Zeppelin (2002) found that the average frequency of occurrence (FO) of pollock in the diet of central Aleutian Islands area Steller sea lions from 1990-1998 was low, and that Atka mackerel appears to have been the primary food source for sea lions (i.e., found in 64.9% of scats; Table 8). Sinclair and Zeppelin (2002) point out that although some of the food items had a low FO when averaged across all samples, some had higher occurrences when looked at during specific seasons or at specific sites (see Sinclair and Zeppelin 2002, their Appendix 1). Specifically, areas within the eastern Aleutian Islands area seem to be more dependent upon pollock with a FO of 59.1% from December – April (Table 8; Region 3). In Table 9, the FO is provided for various cites near Adak in the central Aleutian Islands (Sinclair and Zeppelin 2002; their Appendix 1). Pollock ranked among the top three prey species at both Kasatochi Island (summer) and at Ulak Island (summer), both of which are rookeries in the Central Aleutian Islands.

Beyond the published literature, NMFS unpublished data are available on scats collected since 1998 in the central Aleutian Islands area near Adak. Table 10 describes the prey items found in scats at Adak, Amlia, and Kasatochi in 1999 and 2000, and Table 11 describes scats at a variety of sites in the central Aleutian Islands since 2001. In general, Atka mackerel was the dominant prey item found, especially during the summer. Pollock was more important in the diet during the winter but was also found at some sites during the summer (Tables 10 and 11; Figure 9). In the most recent samples collected during the winter in 2002, pollock was between 8% and 46% FO at Seguam and Silak (Table 11). In these samples pollock was much more important in the diet than the average values reported above and likely represent the local availability of prey as well as the variability in sampling times. Season appears to be an important consideration as pollock was most often in the diet of Steller sea lions during the winter.

From February 21 through March 1, 2002 the R/V Kaiyo Maru conducted an echo integration-trawl survey (EIT) in the Aleutian Islands area that partially covered the two proposed study sites (Nishimura et al. 2002). The biomass estimates produced by this survey are considered conservative because the survey was limited to waters deeper than 100m, and a portion of pollock biomass would be expected to be inshore of 100m at this time of year. The 2002 EIT survey estimated there to be approximately 20,000 mt in the portion of the Atka Island study area (Leg 2-2) surveyed and 18,000 mt within the portion of the Kanaga Island study area (Leg 2-4) surveyed. For the entire survey region from 170˚ W longitude to 178˚ W longitude the 2002 EIT survey estimated the pollock biomass to be 123,000 mt.

In summary, pollock is an important prey item for Steller sea lions in the Aleutian Islands, especially in the eastern portion of the area and in other locations where pollock may be available in relatively small aggregations, especially in winter. Based on the differences in the occurrence of pollock in scat samples, pollock may be more important to Steller sea lions using the Atka Island/North Cape haulout than for animals using haulouts near Kanaga Sound. The variability of pollock in the diet of sea lions is likely to be linked to the availability of the prey and is likely to reflect similar patterns as the fishery. Harvest of pollock in the Aleutian Islands has been patchily distributed with some locally high harvest amounts due to dense aggregations of pollock nearshore during spawning. Due to the remoteness of the Aleutian Islands, scat is not frequently collected at many sites which further confounds our ability to draw a clear picture of prey utilization in these areas. From the best information available, pollock is likely to be an important component of Steller sea lion diet in the winter but not during the summer (Tables 10 and 11; Sinclair and Zeppelin 2002). Also from the 2001 Opinion, we know that the ratio of prey biomass available to the biomass consumed by sea lions is the lowest in the Aleutian Islands, and may be lower than what is optimal for their survival (NMFS 2003, their Table III-8). This indicates that sea lions in the Aleutian Islands may be more susceptible to perturbations in the prey field than other areas such as the eastern Bering Sea.

**Fisheries harvest of Steller sea lion prey within the Action Area**

The majority of pollock harvest in the Aleutian Islands subarea has historically taken place inside Steller sea lion critical habitat (Table 13). However, the Aleutian Islands subarea was closed to directed pollock fishing in 1999 (64 FR 3437, January 22, 1999; Table 14) as part of the Steller sea lion conservation measures. The Aleutian Islands subarea was re-opened to pollock fishing outside of critical habitat in January 2003 (68 FR 204, January 2, 2003; Figure 10). Since 1999, no directed fishing for pollock has occurred inside critical habitat.

The nature of the pollock fishery in the Aleutian Islands region has varied considerably since 1977 due to changes in the fleet makeup and in regulations. During the late 1970s through the 1980s the fishing fleet was primarily foreign (Table 16). In 1989, the domestic fleet began operating in earnest and continued in the Aleutian Islands subarea until 1999.

From 1987 through 1994 between 80% and 100% of the annual catch was taken from the area east of 174˚ W (Figure 11; Table 17). From 1995-1998, catch in critical habitat ranged from 74% to 97% of the TAC (Figure 11; Table 14). The highest annual catch in the Aleutian Islands area was in 1991 with 98,000 tons, 99% of which was removed from the area east of

174˚ W, mostly from Amukta Pass (Barbeaux et al., 2005; Table 15). Catch at age data reveal that for 1983 through 1994 the Aleutian Islands catch was largely composed of the 1978 year class (Barbeaux et al., 2005). In 1995 the fishery shifted west and from 1995-1997 the majority (80%-100%) of the annual catch was removed from the area west of 174˚ W. Most of the annual catch from 1995-1997 was removed from the shelf area north of Adak, Kanaga, and Tanaga Islands in area 542 (Figures 11 and 12). In 1998 the fishery shifted farther west and the majority (66%) of catch was removed from around Buldir Pass in area 543. Since 1998 all pollock catch in the Aleutian Islands area has occurred as incidental catch (about 1,000 tons annually), primarily in the Pacific cod and Atka mackerel fisheries (Table 15).

In the 1990s, within the area west of 174˚ W, the fishery was concentrated largely in two areas; northwest of Adak Island and northwest of Atka Island (Figures 11 and 12). In both the Kanaga Sound and Atka study areas, past pollock fishing efforts have been concentrated in the 100 fathom to 500 fathom isobaths. The portion of the area harvest of pollock taken in these sites during the 1990s varied. For Kanaga Sound, the harvest of pollock in the 1990s made up at least 81 % of area 541 harvests (NMFS 2006 their Table 4.1-3). Catch data include directed fishery harvest and incidental take in the Pacific cod fishery.

In the Atka Island site, the harvest of pollock in the 1990s varied from 7 % to 78% of area 541 harvests (NMFS 2006 their Table 4.1-4). It appears that the majority of the Aleutian Islands pollock harvests shifted after 1995 from area 541 to area 542. Much of the harvest in this time period was part of a large 1978 year class (NMFS 2006). In 1998, only 1,837 mt of pollock was harvested in Area 541 with 78 percent of this harvest coming from the Atka Island area. Catch data include directed fishery harvest and incidental take in the Pacific cod fishery.

## Effects of the Action

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02).

Direct effects of the proposed action are primarily related to the removal of pollock from critical habitat. Steller sea lions are likely to be in the action area during the time the project is implemented. The proposed action will reduce the amount of biomass of pollock available to foraging Steller sea lions within critical habitat, potentially modify the prey field through disturbance, and potentially directly interact with Steller sea lions resulting in the death of animals through drowning in the trawl net. Long term effects of the project are unlikely.

### Effects on Steller sea lions

***Competition for prey resources:*** Concentrated harvest of important prey during particular seasons may adversely affect sea lions. For example, during the winter months sea lions may have relatively infrequent foraging opportunities and may be less able to travel large distances in search of food. Similarly, juvenile sea lions may rely on easy feeding opportunities during periods when they are learning to forage independently. Substantial harvests of sea lion prey during these times may lead to nutritional stress, even if ample food is available at other times of the year.

Competition between pollock fishing vessels in the AI and sea lions can occur at a variety of spatial scales. At the macro-scale, potential impacts of fishing include competition for a common resource and/or shifts in predator-prey relationships that may change the carrying capacity of the ecosystem. Observation of these effects is complicated by natural variability of the ecosystem. At the meso-scale, fisheries can affect the distribution and abundance of groundfish in a region such as Shelikof Strait or Bristol Bay that is important to local groups of sea lions. Finally, at a micro-scale fishing vessels can affect the distribution and abundance of groundfish in specific locations, making it harder for sea lions to prey upon groundfish in those areas. The effects of fisheries on the distribution and abundance of fish species have shorter duration as the spatial scale of impact decreases. Nevertheless, localized depletions of fish that are prey for sea lions can be important for the affected individuals, especially during vulnerable life stages (e.g., juveniles or nursing mothers) and near important habitat areas (e.g., haulouts).

If these reductions in pollock schools occur within the foraging areas of Steller sea lions, the reduced availability of prey may reduce their foraging effectiveness. The effects of these reductions become more significant the longer they last and the reductions are likely to be most significant for juvenile and adult female Steller sea lions during the winter months when these animals have their highest energetic demands.

Information about the potential impacts of trawl fisheries on sea lion prey is mixed (Logerwell 2005). NMFS has conducted a number of experiments to determine whether trawl fisheries alter the prey field for Steller sea lions. For pollock fisheries, of the two years that the experiment was completed, one year of the study observed a change to the prey field and one year did not. Mixed results were also found for the Atka mackerel fishery in the Aleutian Islands (testing of closure areas), while no indication of localized depletion was found for the Pacific cod fishery in the EBS experiment. Conclusions based on the Pacific cod study conflict with an analysis of the Pacific cod fishery using winter survey data from 2001 (Fritz and Brown 2005).

The 2001 Biological Opinion (NMFS 2001) explicitly states that trawl fishing is the most likely fishing activity to negatively impact Steller sea lions both indirectly by removing large quantities of pollock from foraging areas and directly by entanglement in fishing gear. A trawl fishery for pollock within critical habitat has a potential to negatively impact juveniles and adult females. In the winter, satellite telemetry data indicates that adults spent about 20.9% (n=96 locations) of the time at-sea beyond 10 nm from land (NMFS 2003, their Table II-5). Juveniles older than 10 months, spent 32.1% (n=586 locations) of the time at-sea beyond 10 nm from land (NMFS 2003, their Table II-6). Previous analyses from the 1990s indicated that adult females spend 66.7% of their time greater than 20 nm from shore (NMFS 2003, their Table II-1). In general, Steller sea lions are likely to be foraging within the project areas (Table 7).

Juveniles and adult females have been identified as the most likely groups to be negatively impacted by competition with fisheries (Loughlin and York 2000). A decline in juvenile survival and lower reproductive success for adult females, due to reduced prey availability, have been identified as possible causes for the decline in the 1990s (York 1994, Holmes and York 2003). There appears to be a positive correlation between the implementation of conservation measures in the late 1990s and early 2000s and stabilization and recovery in the western population. However, it is too early to conclude whether the recent apparent leveling off is real or necessarily due to the conservation measures implemented. Based on available survey data, the current rate of increase would have to continue for four more years (and be surveyed at two-year intervals during that period) for the increase in numbers to be statistically significant (NMFS 2000).

***Effects of the removal of prey resources:*** Due to a higher than average 1999 year class the biomass in the Aleutian Islands in 2006 is expected to be larger than that observed in 2002 (Nishimura et al. 2002, Barbeaux et al. 2005). Given the conservative estimates provided by the 2002 EIT survey, the proposed project would be expected to take less than 5.0% or 5.5% of the pollock biomass in the Atka Island or Kanaga Island study areas respectively and less than 0.8% of the pollock biomass for the region between 170˚ W longitude to 178˚ W longitude.

Pollock is an important prey species for Steller sea lions in the Aleutian Islands especially in the winter. In 2002, pollock was found in 8, 27, and 46% of scat samples collected at three sites sampled in the winter in the central Aleutian Islands (Table 11). In winter, pollock was found in most scats in the eastern Aleutian Islands (59.1%) and much less overall in the central Aleutian Islands (2.7%) as reported in Sinclair and Zeppelin (2002). Based on the differences in the occurrence of pollock in scat samples, pollock may be more important to Steller sea lions using the Atka Island/North Cape haulout than for animals using haulouts near Kanaga Sound.

Up to 1,000 mt of pollock could be taken from one of the two study sites under the EFP. The amount of groundfish harvest within 3 nm of a haulout will be limited to 10 mt per tow and tows limited to only as many needed to verify the acoustic data. It is very likely that the majority of the groundfish during the EFP fishing will be pollock (NMFS 2006). Based on a 2002 winter pollock survey in the Umnak Island area, the amount of harvest under this EFP is expected to be less than 1 % of the biomass expected to occur in the study areas (Nishimura et al. 2002). This amount of overall harvest in relation to biomass is well within the harvest control rule for pollock under the Steller sea lion protection measures (50 CFR 679.20(d)(4)).

Conservations measures included in the proposed action:

- fishing activity is limited to only one of the areas identified for this project,
- the area of fishing is limited,
- each tow inside 3 nm is limited to 10 mt,
- removals are expected to be less than 1 % of the total biomass for the area,
- one vessel is used,
- and the project is of a short duration.

***Synthesis of effects on Steller sea lions:*** Localized removals of pollock may affect foraging Steller sea lions. Animals using the Atka Island/North Cape haulout may be potentially impacted more based on their greater dependence on pollock as a prey species compared to animals further west in the central Aleutian Islands (e.g., NMFS statistical area 542). Removing 1,000 mt during a two week time period from Atka Island/North Cape is similar to the overall amount of pollock harvested in 1998 when 78% of area 541 pollock harvest was taken from the Atka Island area (NMFS 2006). Pollock biomass estimates are not available for this area in 1998. It is possible that this proposed action may result in localized depletion of pollock prey within the action area. This may affect Steller sea lions using the Atka Island/North Cape haulout to a greater extent than Kanaga Sound due to the greater reliance of sea lions on pollock in the eastern portion of the central Aleutian Islands. Any impacts on prey would be limited to the animals using the haulouts in the study areas or animals foraging as they pass through the area.

Issuing the EFP would result in one vessel harvesting pollock inside one of the project areas for approximately three weeks in March. Fishing inside critical habitat would increase the possibility of encountering Steller sea lions during fishing operations. The potential for encounters within 3 nm of haulouts is reduced by the limitations on fishing in this area, as determined by the NMFS scientist to verify the acoustic data. Considering the size of the area of each site (Figures 1 and 2) and the relatively small harvest amount, disturbance by the single vessel used in this project is possible but of minor intensity and short duration.

The proposed action may adversely affect some Steller sea lions by increasing the potential for incidental take, disrupting pollock aggregations or reducing available pollock for foraging Steller sea lions, and by disturbance of animals as activities occur in waters where more Steller sea lions may occur (0-10 nm). Because of the small portion of the western population of Steller sea lions that is likely to be present in the project areas and the short duration of the project, any disturbance that may occur, is unlikely to cause population level effects.

**Effects on critical habitat**

There is little information available on the foraging requirements of Steller sea lions at the local or global scale. However, the best available information on prey availability at a relatively broad scale is the analysis that was presented in the 2001 BiOp in Section 5.3.3. In that analysis, NMFS investigated the amount of biomass available by area in the eastern Bering Sea (EBS), AI, and GOA and the amount of prey the local populations of Steller sea lions may require. A number of assumptions were made in the analysis and the reader should review Section 5.3.3. of the 2001 Biological Opinion (NMFS 2001) for the details of that exercise.

The forage ratio for the EBS (see Table III-8 in NMFS 2003) is much higher than the ratio for a “healthy” stock of Steller sea lions foraging on a theoretical, unfished groundfish population (446 compared to 46 for the "healthy" case)(NMFS 2000, 2001). The forage ratios for the GOA and AI are substantially lower than the EBS and are also below the healthy range. However, the ratio in the Aleutian Islands was only 11 times the amount consumed annually by Steller sea lions which is relatively low and represents a similar fraction to the amount taken by fisheries (e.g., Atka mackerel). Interpretation of these ratios is not straightforward, as Steller sea lions forage on species other than pollock, Pacific cod, and Atka mackerel. This information indicates that fisheries effects are more likely in the AI and the GOA than in the EBS. Therefore, depletion of prey in critical habitat in the Aleutian Islands may be more likely than similar fisheries in other areas.

Due to a lack of data on the distribution of pollock biomass, movements, and spawning aggregations in the Aleutian Islands, it is difficult to predict local effects of the pollock fishery on the prey field. The data on Aleutian Islands pollock is much less than that for EBS pollock. It appears that sea lions consume pollock in the affected area as a portion of a diverse diet often dominated by Atka mackerel (Table 8). Removal of 1,000 mt (roughly 5% of the local biomass), in this small area is likely more significant that a similar fishery in either the EBS or perhaps the Gulf of Alaska. We expect that the local harvest rates on the pollock biomass in these two areas would be relatively low (compared to the annual expected harvest rate as determined in the stock assessment). Calculations of local harvest rates for pollock fisheries was made in NMFS (2003 their Table III-7), but not for pollock in the AI in part because that fishery was closed inside critical habitat. Based on the current stock assessment (Barbeaux et al. 2005) and conservative estimates provided by the 2002 EIT survey (Nishimura et al. 2002), the proposed project would be expected to take less than

5.5% of the pollock biomass in the Atka Island or Kanaga Island study areas respectively and less than 0.8% of the pollock biomass for the region between 170˚ W longitude to 178˚ W longitude. Based on the relatively low harvest rate expected in these localized areas, the fact that only one vessel will be used over a 3 week time period, and the conservation measures encompassed in the project, the impact of the action on prey resources for Steller sea lions is unlikely to substantially reduce the conservation value of that habitat for Steller sea lions.

## Cumulative Effects

"Cumulative effects" include the effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area considered in this biological opinion (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Past and present impacts of non-federal actions are part of the environmental baseline of this biological opinion. Cumulative effects that reduce the capacity of listed species in the action area to meet their biological requirements increase the risk to the viability of the species, and consequently increase the risk that the proposed action on the species or its habitat will result in jeopardy (NMFS 1999). The action area for this proposed action is subject to a variety of activities which potentially affect the prey field for Steller sea lions as well as result in incidental take.

### Subsistence harvest

The subsistence harvest of Steller sea lions by Alaska natives results in direct mortalities that are expected to continue into the foreseeable future. These takes represent the highest level of known direct mortality from an anthropogenic source. The primary areas of subsistence harvest of western population Steller sea lions is in the Aleutian Islands (96 animals in 2004; Wolfe et al. 2004). Subsistence harvest may be a substantial source of mortality in the action area within the western population of Steller sea lion.

### State of Alaska managed fisheries

The State of Alaska (State) manages commercial fisheries, subsistence fisheries, and sport fisheries which occur within the action area. Subsistence and sport fisheries occur for species other than pollock (e.g., halibut, crab, and salmon). However, State managed commercial fisheries do occur within the action area within critical habitat and may take Steller sea lions and reduce the availability of prey. Future State managed fisheries include a new Pacific cod fishery in the Aleutian Islands within State waters (starting in 2006), and numerous proposals have been considered to open areas within critical habitat in the Aleutian Islands to pollock fishing. These actions could have a substantial impact on the prey availability for Steller sea lions and may result in incidental take.

### Alaska State population growth

Alaska has the lowest population density of all of the states in the United States. Although Alaska's population has increased by almost 50 percent in the past 20 years, most of that increase has occurred in the Cities of Anchorage and Fairbanks. Outside of Anchorage, the largest populations occur on the Kenai Peninsula, the Island of Kodiak, Bethel, and in the Valdez - Cordova region. Outside of the City of Anchorage, few of the cities, towns, and villages would be considered urbanized. Within the action area, Adak represents the largest community and is trying to establish itself as a larger, and growing community in the

Aleutian Islands. Their intent is to establish fisheries and a community built on resource development which may impact Steller sea lions and their critical habitat.

### Conclusions

After reviewing the status of the western population of Steller sea lion and its critical habitat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of these species and is not likely to destroy or adversely modify designated critical habitat. These conclusions are based on the following considerations.

The action area (CAI; Figure 4) is used extensively by western population Steller sea lions. From the 1970s to 2000, the CAI non-pup Steller sea lion population declined by 85%, but from 2000 to 2004 the CAI increase by 10% (roughly 450 animals; Table 1). Pup counts declined by 72% from the mid-1980s to 2001-2002 and continued to decline by 2% to 2005. Diet in the CAI is dominated by Atka mackerel and to a lesser extent pollock, especially during the winter. Pollock spawning aggregations are patchily distributed in the CAI and are likely to be targeted by Steller sea lions in relationship to their availability to them. This appears to be reflective of the food habits data which show patchy reliance on pollock as a prey resource. This has two implications; first, pollock may be locally important to sea lions feeding on those dense aggregations of spawning prey, and second, sea lions in general rely to a greater extent on a variety of prey in the CAI dominated by Atka mackerel. The proposed action will remove prey from Steller sea lion critical habitat which will likely alter the prey field in which sea lions are likely to forage. However, due to the limited reliance on this prey due to its patchy distribution and the relatively small harvest amounts and intensity of fishing it is unlikely that individual sea lions will be exposed to a stressor that would result in any measurable response. It is also likely that the proposed fishing activity will result in no discernible change to the prey field and the conservation value of critical habitat. Since this project is for only one application, long term effects on prey are very unlikely. At this reduced harvest rate, impacts to the prey field (albeit small) could only be expected to last from hours to potentially a few days at most (Logerwell 2005). Incidental take in the trawl net are unlikely given that only one vessel will be fishing and the take rate in the Alaska groundfish fisheries is relatively low compared to the total number of vessels fishing and the amount of groundfish harvested compared to the proposed action considered here (Angliss and Lodge 2004).

### Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA; provided that such taking is in compliance with the terms and conditions of an incidental take statement. Regulations at 50 CFR 402.14 (i)(1) state that where the Service concludes that an action (or the implementations of any reasonable and prudent alternatives) and the resultant incidental take of listed species will not violate section 7(a)(2), and, in the case of marine mammals, where the unintentional and incidental taking is authorized pursuant to section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA), the Service will provide with the biological opinion a statement concerning incidental take.

However, because no MMPA section 101(a)(5) authorization has been applied for and issued for the proposed action, this opinion does not include an incidental take statement at this time. Once the action agencies or applicant apply for and are issued regulations or authorizations under section 101(a)(5), NMFS will amend this opinion to include an incidental take statement. Any take related to the proposed action occurring without an incidental take statement may result in a violation of the ESA.

**Conservation Recommendations**

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. NMFS does not have any conservation recommendations for this proposed action.

**Reinitiation of Consultation – Closing Statement**

This concludes formal consultation on activities associated with the Exempted Fishing Permit (EFP)(permit #06-01) described in the EA for the proposed action (NMFS 2006). As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately reinitiate formal consultation on the action.

## LITERATURE CITED


Angliss, R.P. and K.L. Lodge. 2004. Alaska Marine Mammal Assessments, 2003. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-144. 230 p.

Burkanov, V. N., and T. R. Loughlin. In press. Historical distribution and abundance of Steller sea lions on the Asian coast. Marine Fisheries Review.

Barbeaux, S., J. Ianelli, and E. Brown. 2005. "Aleutian Islands Walleye pollock." Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea and Aleutian Islands, North Pacific Fishery Management Council, 605 W. 4th Avenue, Suite 306, Anchorage, Alaska 99501-2252.

Bickham, J. W., J. C. Patton, and T. R. Loughlin. 1996. High variability for control-region sequences in a marine mammal: implications for conservation and biogeography of Steller sea lions (*Eumetopias jubatus*). J. Mammal. 77:95-108.

Braham, H. W., R. D. Everitt, and D. J. Rugh. 1980. Northern sea lion decline in the eastern Aleutian Islands. J. Wildl. Mgmt. 44:25-33.

Byrd, G. V. 1989. Observations of northern sea lions at Ugamak Island, Buldir, and Agattu Islands, Alaska in 1989. Unpubl. rep., U.S. Fish and Wildlife Service. Alaska Maritime National Wildlife Refuge.

Calkins, D.G. 1996. Movements and habitat use of female Steller sea lions in Southeastern Alaska. Pages 110-134, 166 in: Steller sea lion recovery investigations in Alaska, 1992-1994. Rep from AK. Dep. Fish and Game, Juneau, AK to NOAA, Wildlife Technical Bulletin 13, May 1996.

Calkins, D.G. 1998. Prey of Steller sea lions in the Bering Sea. Biosphere Conservation 1:33-44.

Calkins, D.G., and K.W. Pitcher. 1982. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 447-546, *in*: Environmental assessment of the Alaskan continental shelf. U.S. Dept. Comm. and U.S. Dept. Int., Final Rep. Principal Investigators, 19:1-565.

Calkins, D.G., and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Unpubl. Rep., Alaska Dep. Fish and Game, 333 Raspberry Road, Anchorage, AK 99518. 76 pp.

Chumbley, K., J. Sease, M. Strick, and R. Towell. 1997. Field studies of Steller sea lions (*Eumetopias jubatus*) at Marmot Island, Alaska 1979 through 1994. NOAA Tech. Memo. NMFS-AFSC-77. 99 pp.

Cottrell, P.E. and A.W. Trites. 2002. Classifying prey hard part structures recovered from fecal remains of captive Steller sea lions (*Eumetopias jubatus*). Marine Mammal Science 18:525-539.

Edie, A. G. 1977. Distribution and movements of Steller sea lion cows (*Eumetopias jubata*) on a pupping colony. Unpubl. M.S. thesis, Univ. British Columbia, Vancouver. 81 pp.

Ferrero, R. C., D. P. DeMaster, P. S. Hill, M. M. Muto, and A. L. Lopez. 2000. Alaska marine mammal stock assessments. NOAA Tech. Memo. NMFS-AFSC-119. 191 pp.

Fritz, L. W., and C. Stinchcomb. 2005. Aerial, ship, and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in the western stock in Alaska, June and July 2003 and 2004. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-153, 56 p.

Fiscus, C.H., and G.A. Baines. 1966. Food and feeding behavior of Steller and California sea lions. J. Mamm. 47:218-223.

Gentry, R. L. 1970. Social behavior of the Steller sea lion. Unpubl. Ph.D. thesis, Univ. California, Santa Cruz. 113 pp.

Gisiner, R. C. 1985. Male territorial and reproductive behavior in the Steller sea lion, *Eumetopias jubatus*. Ph.D. Thesis, Univ. California, Santa Cruz. 145 pp.

Goto, Y., and K. Shimazaki. 1998. Diet of Steller sea lions off the coast of Rausu, Hokkaido, Japan. Biosphere Conservation (1)2:141-148.

Holmes, E.E., and AE. York. 2003. Using ages structure to detect impacts on threatened populations: a case study with Steller sea lions. Conservation Biology 17(6):1794-1806.

Ishinazaka, T., and T. Endo. 1999. The reproductive status of Steller sea lions in the Nemuro Strait, Hokkaido, Japan. Biosphere Conservation 2(1):11-19.

Jameson, R.J., and K.W. Kenyon. 1977. Prey of sea lions in the Rogue River, Oregon. J. Mamm. 58:672

Jones, R.E. 1981. Food habits of smaller marine mammals from northern California. Proc. Calif. Acad. Sci. 42:409-433.

Kajimura, H., and T.R. Loughlin. 1988. Marine mammals in the oceanic food web of the eastern subarctic Pacific. Bull. Ocean Res. Inst. 26:187-223.

Kenyon, K. W., and D. W. Rice. 1961. Abundance and distribution of the Steller sea lion. J. Mamm. 42:223-234.

Logerwell, L. 2005. Presentation and document presented to the North Pacific Fisheries Management Council in June 2005 on the results of fisheries experiments by the Alaska Fisheries Science Center. Document dated June 6, 2005; 18 pages.

Loughlin, T.R. 1993. Status and pelagic distribution of otariid pinnipeds in the Bering Sea during winter. OCS study, MMS 93-0026. 58 pp.

Loughlin, T.R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Pages 159-171, *in*: A. E. Dizon, S. J. Chivers, and W. F. Perrin (eds.), Molecular Genetics of Marine Mammals. Society for Marine Mammalogy Spec. Publ. 3.

Loughlin, T.R., and R. Nelson, Jr. 1986. Incidental mortality of northern sea lions in Shelikof Strait, Alaska. Mar. Mamm. Sci. 2:14-33.

Loughlin, T.R., M.A. Perez, and R.L. Merrick. 1987. *Eumetopias jubatus*. Mammalian Species Account No. 283. Publ. by Amer. Soc. Mamm. 7 pp.

Loughlin, T.R., A.S. Perlov, and V.A. Vladimirov. 1990. Survey of northern sea lions (*Eumetopias jubatus*) in the Gulf of Alaska and Aleutian Islands during June 1989. U.S. Dep. Comm., NOAA Tech. Memo. NMFS F/NWC-176. 26 pp.

Loughlin, T.R., A.S. Perlov, and V.A. Vladimirov. 1992. Range-wide survey and estimation of total number of Steller sea lions in 1989. Mar. Mamm. Sci. 8:220-239.

Loughlin, T.R., A.S. Perlov, J.D. Baker, S.A Blokhin, and A.G. Makhnyr. 1998. Diving behavior of adult female Steller sea lions in the Kuril Islands, Russia. Biosphere Conservation 1:21-31.

Loughlin, T. R., and A. E. York. 2000. An accounting of the sources of Steller sea lion, *Eumetopias jubatus*, mortality. Mar. Fish. Rev. 62(4):40-45.

Loughlin, T. R., J. T. Sterling, R. L. Merrick, J. L. Sease, and A. E. York. 2003. Diving behavior of immature Steller sea lions (*Eumetopias jubatus*). Fish. Bull. Vol. 101, no. 3, pp. 566-582.

Maniscalco and Atkinson 2004

Mathisen, O. A., R. T. Baade, and R. J. Lopp. 1962. Breeding habits, growth and stomach contents of the Steller sea lion in Alaska. J. Mamm. 43:469-477.

Mathisen, O. A., and R. J. Lopp. 1963. Photographic census of the Steller sea lion herds in Alaska, 1956-58. U.S. Fish and Wildl. Serv. Spec. Sci. Rep. Fish. No. 424. 20 pp.

Merrick, R.L. 1995. The relationship of the foraging ecology of Steller sea lions (*Eumetopias jubatus*) to their population decline in Alaska. Ph.D. dissert., Univ. Washington, Seattle. 171 p.

Merrick, R.L., M.K. Chumbley, and G.V. Byrd. 1987. Diet diversity of Steller sea lions (*Eumetopias jubatus*) and their population decline in Alaska; a potential relationship. Ca. J. Fish. and Aquatic Sci 54:1342-1348.

Merrick, R., P. Gearin, S. Osmek, and D. Withrow. 1988. Field studies of northern sea lions at Ugamak Island, Alaska during the 1985 and 1986 breeding seasons. NOAA Tech. Memo. NMFS F/NWC-143.

Merrick, R. L., L. M. Ferm, R. D. Everitt, R. R. Ream, and L. A. Lessard. 1991. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*)in the Gulf of Alaska and Aleutian Islands during June and July 1990. NOAA Tech. Memo. NMFS F/NWC-196. 34 pp.

Merrick, R. L., D. G. Calkins, and D. C. McAllister. 1992. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*)in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1991. NOAA Tech. Memo. NMFS-AFSC-1. 41 pp.

Merrick, R.L., and D.G. Calkins. 1996. Importance of juvenile walleye pollock, *Theragra chalcogramma*, in the diet of Gulf of Alaska Steller sea lions, *Eumetopias jubatus*. Pages 153-166 *in*: U.S. Dep. Commer. NOAA Tech. Rep. NMFS 126.

Merrick, R. L., and T. R. Loughlin. 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. Can. J. Zool. 75:776-786.

Merrick, R. L., M. K. Chumbley, and G. V. Byrd. 1997. Diet diversity of Steller sea lions (*Eumetopias jubatus*) and their population decline in Alaska: a potential relationship. Can J. Fish Aquat. Sci. 54:1342-1348.

Milette, L.L. and A.W. Trites. 2003. Maternal attendance patterns of lactating Steller sea lions (*Eumetopias jubatus*) from a stable and a declining population in Alaska. Canadian Journal of Zoology 81:340-348.

Nishimura, A., T. Yanagimoto, and Y. Takao. 2002. Cruise results of the winter 2002 Bering Sea pollock survey (Kaiyo Maru). Document for the 2002 STC meeting. Central BS pollock Convention, September 2002.Hokkaido National Fisheries Research Institute.

NMFS. 1992. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland, 92 pp.

NMFS. 1999. The Habitat Approach. Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids. Northwest Region, Habitat Conservation and Protected Resources Divisions, Portland, Oregon (August 26).

NMFS. 2000. Endangered Species Act, Section 7 Consultation Biological Opinion and Incidental Take Statement on the authorization of the Bering Sea/Aleutian Islands and Gulf of Alaska Groundfish Fishery Management Plans. NMFS Alaska Region, Protected Resources Division, Juneau, AK

NMFS. 2001. Endangered Species Act, Section 7 Consultation Biological Opinion and Incidental Take Statement on the authorization of the Bering Sea/Aleutian Islands and

Gulf of Alaska Groundfish Fishery Management Plan Amendments 61 and 70. NMFS Alaska Region, Protected Resources Division, Juneau, AK.

NMFS. 2003. Supplement to the 2001 Endangered Species Act, Section 7 Consultation, Biological Opinion and Incidental Take Statement on the authorization of the Bering Sea/Aleutian Islands and Gulf of Alaska Groundfish Fishery Management Plan Amendments 61 and 70. NMFS Alaska Region, Protected Resources Division, Juneau, AK.

NMFS. 2006. Environmental assessment for the issuance of an exempted fishing permit for feasibility testing of using commercial pollock fishing vessels for acoustic surveys within portions of Steller sea lion critical habitat areas in the Aleutian Islands subarea. NMFS Alaska Region, Sustainable Fisheries Division, Juneau, AK.

Olesiuk, P.F., M.A. Bigg, G.M. Ellis, S.J. Crockford, and R.J. Wigen. 1990. An assessment of the feeding habits of harbour seals (*Phoca vitulina*) in the Strait of Georgia, British Columbia, based on scat analysis. Can. Tech. Rep. Fish. and Aquat. Sci. No. 1730.

Orr, R.T., and T.C. Poulter. 1967. Some observations on reproduction, growth, and social behavior in the Steller sea lion. Proc. California Acad. Sci. 35:193-226.

Panina, G. K. 1966. On the feeding of the sea lion and seals on the Kuril Islands. Izv. TINRO 58:235-236. In Russian. (Transl. by Bur. Commer. Fish., Off. Foreign Fish., U. S. Dep. Interior, Washington, D.C.)

Pascual, M.A., and M.D. Adkison. 1994. The decline of the Steller sea lion in the northeast Pacific: demography, harvest or environment. Ecol. Applications 4:393-403.

Perez, M. A., and T. R. Loughlin. 1991. Incidental catch of marine mammals by foreign-directed and joint-venture trawl vessels in the U.S. EEZ of the North Pacific, 1973-88. NOAA Technical Report 104. 57 p

Perlov, A.S. 1971. The onset of sexual maturity in sea lions. Proc. All Union Inst. Marine Fish. Ocean. 80:174-187.

Pitcher, K.W., and D.G. Calkins. 1981. Reproductive biology of Steller sea lions in the Gulf of Alaska. J. Mamm. 62:599-605.

Pitcher, K.W., D.G. Calkins, and G.W. Pendleton. 1998. Reproductive performance of female Steller sea lions: an energetics-based reproductive strategy? Canadian Journal of Zoology 76:2075-2083.

Raum-Suryan, K L., K.W. Pitcher, D.G. Calkins, J.L. Sease, and T.R. Loughlin. 2002. Dispersal, rookery fidelity and metapopulation structure of Steller sea lions (*Eumetopias jubatus*) in an increasing and a decreasing population in Alaska. Marine Mammal Science 18:746-764.

Raum-Suryan, K.L., M.J. Rehberg, G.W. Pendleton, K.W. Pitcher, and T.S. Gelatt. 2004. Development of dispersal, movement patterns, and haul-out use by pup and juvenile Steller sea lions (*Eumetopias jubatus*) in Alaska. Marine Mammal Science 20:823-850.

Repenning, C.A. 1976. Adaptive evolution of sea lions and walruses. Syst. Zool. 25:375-390.

Sease, J.L., J.P. Lewis, D.C. McAllister, R.L. Merrick, and S.M. Mello. 1993. Aerial and shipbased surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1992. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-17, 57 pp.

Sease, J.L., and T.R. Loughlin. 1999. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1997 and 1998. NOAA Tech. Memo. NMFS-AFSC-100. 61 pp.

Sease, J. L., J. M. Strick, R. L. Merrick, and J. P. Lewis. 1999. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1996. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-99, 43 pp.

Sease, J. L., W. P. Taylor, T .R. Loughlin, and K. W. Pitcher. 2001. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*)in Alaska, June and July 1999 and 2000. noaa Tech. Memo. NMFS-AFSC-122. 52 pp.

Sease, J. L., and C. J. Gudmundson. 2002. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) from the western stock in Alaska, June and July 2001 and 2002. NOAA Tech. Memo. NMFS-AFSC-131. 45 pp.

Sigler, M.F., J.N. Womble, and J.J. Vollenweider. 2004. Availability to Steller sea lions (*Eumetopias jubatus*) of a seasonal prey resource: a prespawning aggregation of eulachon (*Thaleichthys pacificus*). Canadian Journal of Fisheries and Aquatic Sciences, Vol. 61, no. 8, pp. 1475-1484

Sinclair, E., and T. Zeppelin. 2002. Seasonal and spatial differences in diet in the western stock of Steller sea lions (*Eumetopias jubatus*). J. Mammal. 83(4):973-990.

Strick, J.M., L.W. Fritz, and J.P. Lewis. 1997. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1994. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-71, 55 pp.

Spalding, D.J. 1964. Comparative feeding habits of the fur seal, sea lion and harbour seal on the British Columbia coast. Bull. Fish. Res. Board Canada 146:1-52.

Thorsteinson, F.V., and C.J. Lensink. 1962. Biological observations of Steller sea lions taken during an experimental harvest. J. Wildl. Mgmt. 26:353-359.

Tollit, D.J., M. Wong, A.J. Winship, D.A.S. Rosen, and A.W. Trites. 2003. Quantifying errors associated with using prey skeletal structures from fecal samples to determine the diet of the Steller sea lion (*Eumetopias jubatus*). Marine Mammal Science, Vol. 19, no. 4, pp. 724-744.

Tollit, D.J., S.G. Heaslip, T.K. Zeppelin, R. Joy, K.A. Call, A.W. Trites. 2004. A method to improve size estimates of walleye pollock (*Theragra chalcogramma*) and Atka mackerel (*Pleurogrammus monopterygius*) consumed by pinnipeds: digestion correction factors applied to bones and otoliths recovered in scats. Fishery Bulletin, Vol. 102, no. 3, pp. 498-508

Treacy, S.D. 1985. Feeding habits of marine mammals from Grays Harbor, Washington to Netarts Bay, Oregon. Pages 149-198 in: R. J. Beach, A. C. Geiger, S. J. Jeffries, and B. L. Troutman (eds.). Marine mammals and their interactions with fisheries of the Columbia River and adjacent waters. NWAFC Proc. Rep. 85-04.

Trites, A.W. and B.T. Porter. 2002. Attendance patterns of Steller sea lions (*Eumetopias jubatus*) and their young during winter. Journal of Zoology, London 256:547-556.

Trites, A.W., D.G. Calkins, and A.J. Winship. 2003. Diet and the decline of Steller sea lions in Alaska. Proceedings of the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC.

Withrow, D.E. 1982. Using aerial surveys, ground truth methodology, and haul out behavior to census Steller sea lions, *Eumetopias jubatus*. M.S. Thesis, Univ. Washington, Seattle. 102 pp.

Wolfe, R.J., J.A. Fall, and R.R. Stanek. 2004. The subsistence harvest of harbor seal and sea lion by Alaska natives in 2003. Final report for year eleven, the subsistence harvest of sea lions and harbor seals by Alaska natives (award number NA17FX2835). Prepared for NMFS by Alaska Dept. Fish and Game, Juneau, Alaska, 253 pp.

Womble, J.N., M.F. Willson, M.F. Sigler, B.P Kelly, and G.R. VanBlaricom. 2005. Distribution of Steller sea lions Eumetopias jubatus in relation to spring-spawning fish in SE Alaska. Marine Ecology Progress Series, Vol. 294, pp. 271-282

York, A. 1994. The population dynamics of the northern sea lions, 1975-85. Mar. Mamm. Sci. 10:38-51.

Zeppelin, T.K., D.J. Tollit, K.A. Call, T.J. Orchard, and C.J. Gudmundson. 2004. Sizes of walleye pollock (*Theragra chalcogramma*) and Atka mackerel (*Pleurogrammus monopterygius*) consumed by the western stock of Steller sea lions (*Eumetopias jubatus*) in Alaska from 1998 to 2000. Fishery Bulletin, Vol. 102, no. 3, pp. 509-521.

Table 1. Counts of adult and juvenile (non-pup) Steller sea lions at western stock rookery and haul-out trend sites in Alaska during June-July surveys from 1976 to 2004 (NMFS 2000, Sease et al. 2001, Sease and Gudmundson 2002, and Fritz and Stinchcomb 2005). Numbers in parentheses are the number of trend sites counted in each sub-area. Percentage changes between years are shown in bold.

| Year(s) | Gulf of Alaska | | | Aleutian Islands | | | Kenai-Kiska (69) | Western Stock in Alaska (82) |
|---|---|---|---|---|---|---|---|---|
| | Eastern (9) | Central (15) | Western (9) | Eastern (11) | Central (34) | Western (4) | | |
| 1956-60[1] | | 34,792 | 15,772 | 44,020 | 17,120 | | 111,704 | |
| 1962 | | | | | 23,175 | | | |
| 1976-79[2] | 7,053 | 24,678 | 8,311 | 19,743 | 36,632 | 14,011 | 89,364 | 110,428 |
| 1985 | | 19,002 | 6,275 | 7,505 | 23,042 | | 55,824 | |
| 1989 | 7,241 | 8,552 | 3,908 | 3,032 | 7,572 | | 23,064 | |
| 1990 | 5,444 | 7,050 | 3,915 | 3,801 | 7,988 | 2,327[3] | 22,754 | 30,525 |
| 1991 | 4,596 | 6,270 | 3,732 | 4,228 | 7,496 | 3,083 | 21,726 | 29,405 |
| 1992 | 3,738 | 5,739 | 3,716 | 4,839 | 6,398 | 2,869 | 20,692 | 27,299 |
| 1994 | 3,365 | 4,516 | 3,981 | 4,419 | 5,820 | 2,035 | 18,736 | 24,136 |
| 1996 | 2,132 | 3,913 | 3,739 | 4,715 | 5,524 | 2,187 | 17,891 | 22,210 |
| 1998 | 2,110[4] | 3,467 | 3,360 | 3,841 | 5,749 | 1,911 | 16,417 | 20,438 |
| 2000 | 1,975 | 3,180 | 2,840 | 3,840 | 5,419 | 1,071 | 15,279 | 18,325 |
| 2002 | 2,500 | 3,366 | 3,221 | 3,956 | 5,480 | 817 | 16,023 | 19,340 |
| 2004[5] | 2,536 | 2,944 | 3,512 | 4,707 | 5,936 | 898 | 17,099 | 20,533 |
| **1950s to 2000** | | **-91%** | **-82%** | **-91%** | **-68%** | | **-86%** | |
| **1970s to 2000** | **-72%** | **-87%** | **-66%** | **-81%** | **-85%** | **-92%** | **-83%** | **-83%** |
| **1970s to 1990** | **-23%** | **-71%** | **-53%** | **-81%** | **-78%** | **-83%** | **-75%** | **-72%** |
| **1990 to 2000** | **-64%** | **-55%** | **-27%** | **+1%** | **-32%** | **-54%** | **-33%** | **-40%** |
| **2000 to 2004** | **+28%** | **-7%** | **+24%** | **+23%** | **+10%** | **-16%** | **+12%** | **+12%** |

[1] 1956 counts for the western GOA, 1957 counts for the central GOA, 1959 counts for the central Aleutians and 1960 counts for the eastern Aleutians.
[2] 1976 counts for the eastern, central, and western GOA and the eastern Aleutians, and 1979 counts for the central and western Aleutians.
[3] Gillon Point rookery, Agattu Island not surveyed in 1990.
[4] 1999 counts substituted for sites in the eastern Gulf of Alaska not surveyed in 1998.
[5] 2004 counts were from medium format photographs, while all others were from 35 mm photographs, aerial counts or beach counts. 2004 data reflect a –3.64% adjustment to account for film format resolution and count differences (Fritz and Stinchcomb 2005).

Table 2. Counts of Steller sea lion pups at western stock rookeries in Alaska during 1979 to 2004 (NMFS 1992, Sease and Loughlin 1999; Fritz and Stinchcomb 2005; NMML, unpublished). Percentage changes between years are shown in bold.

| | Gulf of Alaska | | | Aleutian Islands | | | Eastern Bering Sea | Kenai- | Western Stock |
|---|---|---|---|---|---|---|---|---|---|
| Year(s) | Eastern[1] | Central[2] | Western[3] | Eastern[4] | Central[5] | Western[6] | Walrus Island | Kiska[7] | in Alaska |
| 1979 | | | 8,616 | | | | | | |
| 1982 | | | | | | | 334 | | |
| 1984 | | | 6,435 | | | | | | |
| 1985-89 | | 10,254 | | 4,778 | 9,428 | | 250 | 30,895[7] | |
| 1990-92 | | 4,904 | 1,923 | 2,115 | 3,568 | | 63 | 12,510 | |
| 1994 | 903 | 2,831 | 1,662 | 1,756 | 3,109 | | 61 | 9,358 | |
| 1996 | 584 | | | | | | | | |
| 1997 | 611 | | | | | 979 | 35 | | |
| 1998 | 689 | 1,876 | 1,493 | 1,474 | 2,834 | 803 | | 7,677 | 9,169 |
| 2001-02 | 586 | 1,721 | 1,671 | 1,561 | 2,612 | 488 | 39 | 7,565 | 8,678 |
| 2003-04 | 716 | 1,609 | 1,577 | 1,731 | | | | | |
| 2005 | 715 | 1,651 | 1,707 | 1,921 | 2,551 | 343 | 29 | 7,830 | 8,917 |
| **Earliest count to 1994** | | **-72%** | **-81%** | **-63%** | **-67%** | | | **-70%** | |
| **Earliest count to 2001-02** | **-35%** | **-83%** | **-81%** | **-67%** | **-72%** | **-50%** | **-88%** | **-76%** | **-5%** |
| **1994 to 2001-02** | **-35%** | **-39%** | **+1%** | **-11%** | **-16%** | | **-36%** | **-19%** | |
| **2001-02 to 2005** | **+22%** | **-4%** | **+2%** | **+23%** | **-2%** | **-30%** | **-25%** | **+4%** | **+3%** |

[1] Seal Rocks and Fish (Wooded) Island
[2] Outer, Sugarloaf, Marmot, Chowiet and Chirikof Islands
[3] Atkins and Chernabura Islands, and Pinnacle Rock and Clubbing Rocks
[4] Ugamak, Akun, Akutan, Bogoslof and Adugak Islands
[5] Yunaska, Seguam, Kasatochi, Adak, Tag, Ulak, Ayugadak and Kiska (2) Islands, and Gramp and Column Rocks.
[6] Buldir, Agattu (2), and Attu Islands
[7] Rookeries in the Central and Western Gulf of Alaska, and Eastern and Central Aleutian Islands

Table 3. Counts of adult and juvenile (non-pup) Steller sea lions on terrestrial trend sites in Russia.

| Year | W. Bering Sea | Commander Islands | E. Kamchatka | Kuril Islands | Tuleny Island | Sea of Okhotsk |
|---|---|---|---|---|---|---|
| 1963 | | 2,920[1] | | 14,660 | 60[2] | |
| 1969 | | | | 14,184 | | |
| 1971 | | 2,920 | | | | |
| 1973 | | 3,503 | | | | |
| 1974 | | | | | 49 | 1,208 |
| 1975 | | | | 8,397 | | |
| 1977 | | 4,480 | | | | |
| 1978 | | 2,807 | | | 26 | |
| 1981 | | 2,101 | | 5,921 | | |
| 1982 | 4,910 | 1,577 | | | | |
| 1983 | 3,230 | 1,761 | 2,073 | | 65 | |
| 1984 | | 1,930 | | | | |
| 1985 | 3,370 | 1,700 | | | 137 | |
| 1986 | | 2,633 | | | 450 | |
| 1987 | 1,231 | 2,267 | 1,690 | | | |
| 1988 | | 1,221 | | | 171 | 1,691[3] |
| 1989 | 1,199 | 896 | 1,519 | 4,488 | 190 | |
| 1990 | | 865 | | | 410 | |
| 1991 | 427 | 752 | 794 | | 350 | |
| 1992 | | 843 | | | 463 | |
| 1993 | | 569 | | | 549 | |
| 1994 | 200 | 543 | 642 | | 557 | |
| 1995 | | 653 | | | | |
| 1996 | | 804 | | | 615 | 2,429[4] |
| 1997 | | 812 | | | 679 | |
| 1998 | | 900 | | | 836 | |
| 1999 | 180 | 860 | 720 | | 770 | |
| 2000 | | 741 | | | 1,155 | |
| 2001 | | 718 | 669 | 5,129 | 857 | 2,324 |
| 2002 | 16 | 581 | 491 | | 1,041 | 2,072 |
| 2003 | | 530 | | 5,178 | 1,119 | |
| 2004 | 91 | 674 | 548 | | 1,084 | 2,357 |
| 2005 | | | | 5,544 | 1,218 | |

[1]1962 data. [2]1964 data. [3]1989 data for Iony Island. [4]1995 data for Yamsky Islands and 1997 data for Iony Island.

Table 4. Counts of Steller sea lion pups on rookery trend sites in Russia.

| Year | Commander Islands | E. Kamchatka | Kuril Islands | Tuleny Island | Sea of Okhotsk |
|---|---|---|---|---|---|
| 1962 | 1 | | | | |
| 1963 | | | 3,673 | | |
| 1969 | 0 | | 3,250 | | |
| 1970 | 3 | | | | |
| 1971 | 4 | | | | |
| 1972 | 9 | | | | |
| 1973 | 26 | | | | |
| 1974 | | | | 1 | 607 |
| 1977 | 19 | | | | |
| 1978 | 26 | | | 0 | |
| 1980 | | | | 6 | |
| 1981 | 48 | | | | |
| 1982 | 83 | | | 0 | |
| 1983 | 104 | | 1,992 | 5 | |
| 1984 | 141 | | | 0 | |
| 1986 | 151 | | 1,560 | 25 | |
| 1987 | 197 | 211 | | | |
| 1988 | 141 | | | 38 | 712[1] |
| 1989 | 195 | | 1,442 | 45 | |
| 1990 | | | | 59 | |
| 1991 | 229 | | | 63 | |
| 1992 | 222 | 108 | 1,623 | 90 | |
| 1993 | 224 | 115 | | 120 | |
| 1994 | 226 | 93 | | 146 | |
| 1995 | 248 | 84 | 1,972 | | |
| 1996 | 261 | 87 | | 219 | 1,250[2] |
| 1997 | 244 | 96 | | 256 | |
| 1998 | 280 | 91 | | 303 | |
| 1999 | 271 | 87 | | 291 | |
| 2000 | 180 | 76 | 1,824 | 340 | |
| 2001 | 228 | 61 | 1,807 | 303 | 1,231 |
| 2002 | 210 | 84 | 1,973 | 410 | 980 |
| 2003 | 216 | | 2,086 | 480 | |
| 2004 | 221 | 107 | | 508 | 1,868 |
| 2005 | 236 | | 2,306 | 407 | |

[1]1989 data for Iony Island. [2]1995 data for Yamsky Islands and 1997 data for Iony Island.

Table 5. Counts of adult and juvenile (non-pup) Steller sea lions at selected sites in the Aleutian Islands area.

| | | SUMMER NON-PUP COUNTS | | | | | | | | | | | | | | | | Average | Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SITENAME** | **Rook** | **1959** | **1977** | **1979** | **1985** | **1989** | **1990** | **1991** | **1992** | **1994** | **1996** | **1998** | **2000** | **2002** | **2004** | **Max** | **Min** | **(90-04)** | **(90-04)** |
| ADAK/ARGONNE POINT | 0 | | | | | | | | | | 141 | 43 | 8 | 99 | 35 | 141 | 8 | 65 | |
| ADAK/CAPE MOFFET | 0 | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | |
| ADAK/CAPE YAKAK | 1 | | | | 325 | | | | 93 | 183 | | 101 | 174 | 68 | 209 | 325 | 68 | 138 | |
| ADAK/LAKE POINT | 1 | | | | 964 | | | | 522 | 582 | | 582 | 700 | 753 | 799 | 964 | 522 | 656 | |
| AGLIGADAK | 1 | | | 993 | 514 | 132 | 274 | 231 | 125 | 8 | 73 | 40 | 48 | 82 | 61 | 993 | 8 | 105 | -78% |
| AMATIGNAK/NITROF POINT | 0 | | | | | | | 104 | 147 | 92 | 72 | 106 | 96 | 40 | 76 | 147 | 40 | 92 | |
| AMLIA/EAST CAPE | 0 | 700 | | 2,463 | 484 | 50 | 40 | 38 | | 87 | 6 | 220 | 86 | 82 | 34 | 2463 | 6 | 74 | -15% |
| ANAGAKSIK | 0 | 700 | | 124 | 307 | | 33 | 65 | 38 | 28 | 32 | 34 | 46 | 40 | 2 | 700 | 2 | 35 | -94% |
| ATKA/CAPE KOROVIN | 0 | 100 | | 14 | | | | | 1 | | | | 12 | 1 | 4 | 100 | 1 | 5 | |
| ATKA/NORTH CAPE | 0 | 550 | | 1,192 | 653 | 333 | 153 | 180 | 118 | 53 | 59 | 156 | 76 | 224 | 383 | 1192 | 53 | 156 | 150% |
| GRAMP ROCK | 1 | 700 | 2,235 | 1,705 | 1,290 | 747 | 712 | 773 | 691 | 537 | 582 | 570 | 580 | 600 | 679 | 2235 | 537 | 636 | -5% |
| KASATOCHI/NORTH POINT | 1 | | | 2,166 | 1,170 | 659 | 641 | 466 | 376 | 288 | 330 | 350 | 390 | 529 | 667 | 2166 | 288 | 449 | 4% |
| KAVALGA | 0 | | 1 | 233 | 1 | - | 8 | 25 | 34 | 21 | 12 | 52 | 50 | 18 | 56 | 233 | 0 | 31 | 600% |
| LITTLE TANAGA STRAIT | 0 | 450 | | 196 | 411 | 150 | 55 | 64 | 51 | 79 | 76 | 234 | 234 | 82 | 49 | 450 | 49 | 103 | -11% |
| SAGIGIK | 0 | | | 262 | 482 | 116 | 66 | 102 | 58 | 13 | 10 | 5 | 22 | 40 | 30 | 482 | 5 | 38 | -55% |
| SEGUAM/FINCH POINT | 0 | | | | | | | | 1 | 27 | 1 | 56 | 14 | 27 | 2 | 56 | 1 | 18 | |
| SEGUAM/LAVA COVE | 0 | | | | | | | | | | | 40 | | | 0 | 40 | 0 | 20 | |
| SEGUAM/LAVA POINT | 0 | | | | | | | | 22 | 42 | | 128 | | 10 | 5 | 128 | 5 | 41 | |
| SEGUAM/SADDLERIDGE | 1 | 25 | | 4,018 | 2,942 | 602 | 833 | 684 | 696 | 658 | 553 | 586 | 570 | 666 | 923 | 4018 | 25 | 685 | 11% |
| SEGUAM/SW RIP | 0 | | | | | | | | | 50 | | | 23 | 50 | 40 | 50 | 23 | 41 | |
| SEGUAM/TURF POINT | 0 | | | | | | | | 101 | 146 | | | 82 | 84 | 58 | 146 | 58 | 94 | |
| SEGUAM/WHARF POINT | 0 | | | | | | | | 1 | 21 | | 64 | 55 | 50 | 90 | 90 | 1 | 47 | |
| TAG | 1 | 400 | 1,613 | 1,740 | 944 | 590 | 478 | 440 | 370 | 309 | 320 | 370 | 301 | 279 | 242 | 1740 | 242 | 345 | -49% |
| TANADAK (AMLIA) | 0 | 50 | | 264 | 974 | 136 | 60 | 9 | 10 | - | 13 | 10 | 74 | 32 | 1 | 974 | 0 | 23 | -98% |
| UGIDAK | 0 | 400 | | 254 | | 25 | 110 | 26 | 48 | 14 | 12 | 42 | 6 | 23 | 25 | 400 | 6 | 34 | -77% |
| ULAK/HASGOX POINT | 1 | 1,500 | 3,068 | 2,170 | 2,729 | 1,123 | 1,324 | 1,046 | 1,059 | 866 | 844 | 698 | 663 | 481 | 531 | 3068 | 481 | 835 | -60% |
| UNALGA+DINKUM ROCKS | 0 | 350 | 4 | 419 | 544 | 182 | 91 | 101 | 95 | 142 | 80 | 120 | 50 | 46 | 19 | 544 | 4 | 83 | -79% |

Table 6. Food habits information for Steller sea lions collected in the range of the western stock, 1945-1998. (Reprinted from Fritz and Hinckley 2005).

| A. Sample Sizes and Characteristics | | Months | | | | Region | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference | Years | Jan-Mar | Apr-Jun | Jul-Sep | Oct-Dec | CGOA | WGOA | EBS | EAI | CAI | WAI | Russia |
| Imler and Sarber (1947) | 1945 | | | 7 | | 7 | | | | | | |
| Wilke and Kenyon (1952) | 1949, 51 | | | 3 | | | | 3 | | | | |
| Mathisen et al (1962) | 1958 | | 94 | | | | 94 | | | | | |
| Thorsteinson and Lensink (1962) | 1959 | | 56 | | | 9 | 27 | | 20 | | | |
| Tikhomirov (1964) | 1962 | X | X | | | | | X | | | | |
| Fiscus and Baines (1966) | 1960, 62 | | 16 | | | 4 | 2 | 1 | 9 | | | |
| Perlov (1975) | 1966-69 | | | ? | | | | | | | | X |
| Lowry et al (1982) | 1976 | 4 | | | | | | 4 | | | | |
| Pitcher (1981) | 1975-78 | 43 | 54 | 9 | 47 | 136 | 17 | | | | | |
| Calkins (1998) a | 1981 | 60 | | | | | | | | | | 60 |
| Calkins (1998) b | 1981 | 32 | | | | | | 32 | | | | |
| Frost and Lowry (1986) | 1985 | 13 | | | | | | 13 | | | | |
| Gearin (unpub) | 1985, 86 | | | 3 | 8 | | | 11 | | | | |
| Calkins and Goodwin (1988) | 1985, 86 | | X | | X | 74 | | | | | | |
| Merrick et al (1997) a | 1990-93 | | | 76 | | 76 | | | | | | |
| Merrick et al (1997) b | 1990-93 | | | 67 | | | | | 67 | | | |
| Merrick et al (1997) c | 1990-93 | | | 167 | | | | | | 167 | | |
| Merrick et al (1997) d | 1990-93 | | | 28 | | | | | | | 28 | |
| Goto and Shimazaki (1997) | 1994-96 | 62 | | | | | | | | | | 62 |
| Sinclair and Zeppelin (2002) a | 1990-98 | X | X | X | X | 574 | | | | | | |
| Sinclair and Zeppelin (2002) b | 1990-98 | X | X | X | X | | 929 | | | | | |
| Sinclair and Zeppelin (2002) c | 1990-98 | X | X | X | X | | | | 889 | | | |
| Sinclair and Zeppelin (2002) d | 1990-98 | X | X | X | X | | | | | 1370 | | |

Table 6. Food habits information of Steller sea lions collected in the range of the western stock, 1945-1998 (continued).

| B. Food habits data | Sample | Sample | Data | Percent of Sample with Prey Item (x=present) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference | Type | Location | Type | Pollock | Cod | Flatfish | Greenling | Rockfish | Smelts | Sandlance | Herring | Salmon | Sculpin | Shrimp/Crab | Squid | Octopus |
| Imler and Sarber (1947) | Stomach | Land | FO | 57 | | 71 | | | | | | 28 | | | | 43 |
| Wilke and Kenyon (1952) | Stomach | Land | PW | 7 | 10 | 49 | | | | 32 | | | <1 | | | 2 |
| Mathisen et al (1962) | Stomach | Land | FO | | | | 13 | 9 | 14 | 1 | | 1 | 6 | 10 | | 44 |
| Thorsteinson and Lensink (1962) | Stomach | Land | FO | | | 6 | 4 | 11 | | 25 | | | 4 | 2 | | 20 |
| Tikhomirov (1968) | Visual | At-sea | | | | | | | | | D | | | | | |
| Fiscus and Baines (1966) | Stomach | At-sea | FO | 6 | | 12 | 6 | 6 | 56 | 25 | | | 19 | | | |
| Perlov (1975) | Stomach | At-sea | FO | 63 | | | 10 | | | | | | 1 | | >30 | 25 |
| Lowry et al (1982) | Stomach | At-sea | PV | 97 | | 1 | | | | | | | | | 1 | 1 |
| Pitcher (1981) | Stomach | Land | FO | 67 | 12 | 5 | | 3 | 11 | | 11 | 4 | 4 | 7 | 23 | 13 |
| Calkins (1998) a | Stomach | At-sea | FO | 83 | 43 | 3 | | | | | 17 | | >12 | 2 | 2 | 18 |
| Calkins (1998) b | Stomach | At-sea | FO | 100 | 28 | >19 | | 3 | | | 6 | | 6 | >10 | 19 | 19 |
| Frost and Lowry (1987) | Stomach | At-sea | PV | 48 | | | | | | | 48 | | | | | |
| Gearin (unpub) | Stomach | Land | FO | >36 | >45 | 54 | | | | | | | | 18 | | 45 |
| Calkins and Goodwin (1988) | Stomach | Land | FO | 58 | 7 | 14 | | | | 7 | 3 | 3 | 1 | >1 | 4 | 32 |
| Merrick et al (1997) a | Scat | Land | FOSS | 66 | | 4 | <1 | | 6 | | | 20 | 0 | | 3 | |
| Merrick et al (1997) b | Scat | Land | FOSS | 33 | | 2 | 31 | | 8 | | | 17 | 7 | | 2 | |
| Merrick et al (1997) c | Scat | Land | FOSS | 13 | | 0 | 69 | | 1 | | | 6 | 4 | | 8 | |
| Merrick et al (1997) d | Scat | Land | FOSS | 7 | | 0 | 77 | | | | | 5 | 5 | | 7 | |
| Goto and Shimazaki (1997) | Stomach | At-sea | FO | 89 | 76 | 24 | | | | | | | | | 69 | 11 |
| Sinclair and Zeppelin (2002) a | Scat | Land | FO | >50 | >5 | >20 | <5 | x | x | >10 | >10 | >10 | <10 | | <10 | <10 |
| Sinclair and Zeppelin (2002) b | Scat | Land | FO | >70 | >10 | >10 | <5 | x | x | >10 | <10 | >10 | >10 | | <5 | <5 |
| Sinclair and Zeppelin (2002) c | Scat | Land | FO | >50 | >10 | <5 | >20 | x | x | <5 | >5 | >20 | >10 | | <10 | <10 |
| Sinclair and Zeppelin (2002) d | Scat | Land | FO | <10 | >10 | <5 | >60 | x | | <5 | <5 | >20 | >10 | | <20 | <20 |

Abbreviations: CGOA – central Gulf of Alaska; WGOA – western Gulf of Alaska; EBS – eastern Bering Sea; EAI – eastern Aleutian Islands; CAI – central Aleutian Islands; WAI – western Aleutian Islands; X – number for cell is unknown; ? – season of sample collection is unknown but likely to be as indicated; FO=frequency of occurrence; PW=percent by weight; PV=percent by volume; FOSS=Split sample FO.

Table 7. Source of literature, age class/group, sample size (n), capture location, season captured, instrument deployed, and mean trip duration, distance, and time at sea for Steller sea lions tagged with radio (VHF) and satellite (e.g. SLTDR) transmitters. Error is standard deviation unless otherwise indicated.

| Source | Age Class/Group | n | Capture Location | Season | Instrument | Mean Trip Duration (h) | Mean Trip Distance (km) | Mean % Time @ Sea |
|---|---|---|---|---|---|---|---|---|
| Merrick and Loughlin (1997) | Adult Female | 7 | Marmot (CGOA) | Summer | VHF | 21.0 ± 3.7 (SE) | | 53 |
| | Adult Female | 3 | Ugamak (EAI) | Summer | VHF | 25.0 ± 3.9 | | 58 |
| | Adult Female | 4 | EAI to CGOA | Summer | SLTDR | 18.0 ± 3.1 | | 50 |
| | Adult Female | 5 | EAI to CGOA | Winter | SLTDR | 204.0 ± 104.6 | | 90 |
| | YOY | 5 | EAI to CGOA | Winter | SLTDR | 15.0 ± 2.2 | | 38 |
| | | | | | | | | |
| Loughlin et al. (1998) | Adult F | 8 | Kuril Islands, Russia | Summer | SLTDR | short; max = 94 h | 94% trips ≤ 10 km (max=263 km) | |
| Loughlin et al. (2003)[1] | YOY | 12 | CAI, EAI, EGOA, CGOA, and WA | All | SLTDR/SDR | 7.5 ± 7.5 | 7.0 ± 19.0 | |
| | Juv (>10 mo.) | 13 | CAI, EAI, EGOA, CGOA, and WA | All | SLTDR/SDR | 18.1 ± 34.2 | 24.6 ± 57.2 | |
| | Combined | 25 | CAI, EAI, EGOA, CGOA, and WA | All | SLTDR/SDR | 12.1 ± 23.8 | | |
| | | | | | | | | |
| Raum-Suryan et al.( 2004)[2] | YOY (75), Juv (28) | 103 | see below | Spr/Sum/Win | SDR | 84% trips ≤ 20 h | 90% trips ≤ 15 km | |
| | | | | | | | | |
| | Western Stock | 29 | EAI, CGOA, EGOA | Spr/Sum/Win | SDR | | 6.5 (5.08-8.26) CI | |
| | Eastern Stock | 74 | North, South, and Central SE | Spr/Sum/Win | SDR | | 4.7 (3.92-5.53) | |
| | | | | | | | | |
| Fadely et al. (2005)[3] | YOY/Juv | 30 | CAI, EAI, and CGOA | Feb-April | SDR | 8.9 (8.4-9.4) CI | 0.56 (0.56-0.74) CI | |
| | | | | May-July | SDR | 12.5 (11.3-13.9) | 1.30 (0.93-1.49) | |
| | | | | Nov-Jan | SDR | 10.1 (8.2-12.5) | 1.11 (0.74-1.67) | |
| | | | | | | | | |
| Rehberg (2005) | YOY | 11 | CAI and GOA | Spring/Winter | SRDL | | | 42 (38-45) CI |
| | Juv | 12 | CAI and GOA | Spring/Winter | SRDL | | | 51 (49-54) CI |

[1]Trip duration ranged from 1.0 h to 81.3 h (YOY) and 344.0 h (Juv) and trip distance ranged from 1.0 km to 260.7 km (YOY) and 447.3 km (Juv).
[2]Inter-haulout distance averaged 79.3 ± 7.7 km (max = 127 km) and dispersal distances (2 YOY, 2 Juv) included 76, 120, 500, and 1300 km, respectively. Sea lions in the western and eastern stocks used an average of 1.6 and 2.1 haulouts, respectively.
[3]Most locations associated with diving were within 9 to 19 km (5-10 nm) of shore and in waters < 100 m. Trip duration and use of offshore waters increased with age and coincided with spring.
YOY: young-of-the-year; Juv: juvenile (> 1 year unless otherwise specified); VHF: very high frequency radio transmitter; SLTDR: satellite-linked time-depth recorder; SDR: satellite depth recorder; SRDL: satellite relayed dive logger; CAI: central Aleutian Islands; EAI: eastern Aleutian Islands; EGOA: eastern Gulf of Alaska; CGOA: central Gulf of Alaska; SE: Southeast Alaska; WA: Washington State; CI: 95% confidence interval

Table 8. Percent frequency of occurrence of prey items in scat recovered from Steller sea lion scat collected in winter (December - April, 1990-1998; Sinclair and Zeppelin 2002).

| Prey Species | Range (n=3762) | Region 3 | Region 4 |
|---|---|---|---|
| Pollock | 63.2 | 59.1 | 2.7 |
| Atka mackerel | 16.1 | 24.7 | 64.9 |
| Pacific cod | 27.7 | 19.6 | 16.9 |

Table 9. Percent frequency of occurrence of prey items in scat recovered from Steller sea lion scat at various sites near Adak Island (Sinclair and Zeppelin 2002). Samples were collected during the summer except for one set of samples collected at Ulak during the winter (as marked).

| Site | No. of scats | First | Second | Third |
|---|---|---|---|---|
| Kasatochi | 153 | Atka 76 | Sal 48 | Pol 38 |
| Adak - Lake Pt. | 86 | Atka 98 | Sal 23 | Ceph 19 |
| Gramp Rock | 59 | Atka 98 | Ceph 32 | Sal 24 |
| Tag | 99 | Atka 99 | Ceph 20 | P. cod 5 |
| Ulak | 105 | Atka 100 | Ceph 41 | Pol 10 |
| Ulak (winter) | 31 | Atka 71 | Greenling 29 | Ceph 23 |

Table 10. Recent scat samples collected in the Adak/Atka region of the Aleutian Islands subarea (NMML unpublished data). Results are reported as the percent frequency of occurrence and all prey items found in over 5% of the samples are shown.

| **Site** | **Adak - Lake Point** |
|---|---|
| Collection Date | 06/27/99 |
| Number of Scats | 39 |
| **ATKA MACKEREL** | **81** |
| **SALMON** | **65** |
| **POLLOCK** | **24** |
| CEPHALOPOD | 16 |
| ROCKFISH SP | 11 |

| **Site** | **Amlia - Sviech. Harbor** |
|---|---|
| Collection Date | 09/06/00 |
| Number of Scats | 30 |
| **ATKA MACKEREL** | **93** |
| **SAND LANCE** | **52** |
| **POLLOCK** | **34** |
| **PACIFIC COD** | **34** |
| IRISH LORD SP | 21 |
| GADID(NH) | 17 |
| SALMON | 17 |
| DOGTH.LAMPFISH | 14 |
| SAND FISH | 14 |
| POLYCAETE UNID | 10 |
| CEPHALOPOD | 7 |

| **Site** | **Kasatochi - N. Point** |
|---|---|
| Collection Date | 03/12/99 |
| Number of Scats | 20 |
| **PACIFIC COD** | **40** |
| **SALMON** | **25** |
| **ATKA MACKEREL** | **20** |
| **CEPHALOPOD** | **20** |
| SNAILFISH SP | 20 |
| UNIDENT FISH | 20 |
| IRISH LORD SP | 15 |
| SKATE | 15 |
| ROCK GREENLING | 10 |
| SMOOTHTONGUE | 10 |
| *POLLOCK* | *5* |
| ROCKFISH SP | 5 |

Table 11. Percent frequency of occurrence of prey items contained in scat samples. NMML unpublished data for samples collected in the Central Aleutian Islands area.

| Site | Seguam Saddeleridge | Adak Lake Point | Ayugadak | Gramp Rock | Kiska Cape St. Stephen | Kiska Lief Cove | Seguam Saddleridge | Tag | Ulak Hasgox Point | Yunaska | Amlia Sviech Harbor | Seguam Turf Point | Silak |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Scats with prey remains | 33 | 30 | 28 | 45 | 21 | 25 | 7 | 28 | 22 | 27 | 37 | 49 | 35 |
| Collection Date | 6/23/2001 | 6/29/2002 | 7/1/2002 | 6/30/2002 | 7/2/2002 | 7/2/2002 | 6/26/2002 | 6/30/2002 | 6/30/2002 | 6/25/2002 | 3/31/2002 | 3/29/2002 | 4/2/2002 |
| ATKA MACKEREL | 100 | 90 | 82 | 100 | 95 | 80 | 86 | 93 | 100 | 100 | 43 | 71 | 26 |
| POLLOCK | 6 | | | | | | | | | 19 | 27 | 8 | 46 |
| PACIFIC COD | 9 | | 4 | 2 | | 4 | | 4 | | 4 | 14 | 6 | 37 |
| SALMON | 3 | 3 | 4 | 27 | 10 | | | 11 | | 11 | | 8 | 3 |
| CEPHALOPODS | 6 | 17 | 7 | 56 | 14 | 4 | | 7 | 14 | 37 | 30 | 41 | 29 |
| GREENLING SPP | | | 11 | | 5 | 4 | | | | | 27 | 2 | 9 |
| IRISH LORD SP | | | 7 | 2 | | | | | | | 24 | 16 | 43 |
| POLYCAETE UNID | 6 | 7 | 21 | | 10 | 4 | | 7 | | | 19 | 2 | 11 |
| ARROWTOOTH FL | 3 | | | | | | | | | | | | |
| CAT SHARK UNIDENT. | | | | | | | | | | | | | 3 |
| CHUM SALMON | | | | 2 | | | | | | | | | |
| CODLING | | | | | | | | | | | | 2 | 3 |
| DUSKY SNAILFISH | | | | | | | | | | | | | 3 |
| FLATFISH SP. | | | | | 5 | | | | | | 3 | 2 | 6 |
| GREAT-TYPE SCULPIN | | | | | | | | | | | 11 | | 9 |
| GREENLING UNIDENT. | | | | 2 | | | | | | | | | 3 |
| GUNNELS | | | | | | | | | | | | 2 | |
| GYMNOCANTHUS SP | | | | | | | | | | | | | 3 |
| HAKE | | | | | | | | | | | 3 | | |
| HALIBUT | | | | | | | | | | | | 2 | 3 |
| HIGH COCKSCOMB | | | | | | | | | | | | | 3 |
| LAMPREY SPP. | | | | | | | | | | | | 4 | |
| LUMPSUCKER SP | | | | | | | | | | | 3 | | |
| NORTH. LAMPFISH | 6 | | | | | | | | | | | 12 | |
| RIGHTEYE FLOUNDER UN. | | | | | | | | | | | | 2 | |
| ROCK GREENLING | | | | | | | | | | | 8 | | 9 |
| ROCK SOLE | | | | | | | | | | | 3 | | 29 |
| ROCKFISH/SCORPIONFISH UN. | | | | | | | | | | | 3 | | |
| ROCKFISH SP. | | | 4 | | | 4 | | | | 4 | | 4 | 6 |
| RONQUIL SP. | | | | | | | | | | | | | 6 |
| SAND FISH | | | | | | | | | | | 14 | 8 | 3 |
| SAND LANCE | 3 | | 4 | 2 | | | | | | | 3 | | 6 |
| SCULPIN | | | | | | | | | | | | 4 | |
| SKATE | | | | | | | | | | | 8 | 12 | 6 |
| SMOOTH LUMPSUCKER | | | | | | | | | | | 3 | 2 | 3 |
| SNAILFISH SP. | | | | | | | | | | | 22 | 10 | 26 |
| STICHAEIDAE SP. | | | | | | | | | | | | | 6 |
| UNID | | 10 | 4 | | 5 | 16 | 14 | 7 | | | 19 | 16 | 14 |
| UNID GADID | 3 | | | | | | | | | | 5 | | 6 |
| WOLF EEL | | | | | | | | | | | 3 | | |

Table 13. Harvest of pollock in the Aleutian Islands area within areas of critical habitat.

| | Catch Amounts | | | | Proportion in Critical Habitat | | |
|---|---|---|---|---|---|---|---|
| Year | CH 20 nm | Total CH | Outside CH | Total | CH 20 R&H | Total CH | Outside CH |
| 1995 | 60,867 | 60,868 | 4,029 | 64,897 | 94% | 94% | 6% |
| 1996 | 27,725 | 27,726 | 1,326 | 29,052 | 95% | 95% | 5% |
| 1997 | 25,135 | 25,135 | 763 | 25,898 | 97% | 97% | 3% |
| 1998 | 17,612 | 17,612 | 6,174 | 23,786 | 74% | 74% | 26% |
| 1999 | 749 | 749 | 247 | 996 | 75% | 75% | 25% |

Table 14. The percent of critical habitat areas closed in the BSAI and GOA under the Steller sea lion conservation measures.

| | | | % Area Closed | | | | | |
|---|---|---|---|---|---|---|---|---|
| Region | Fishery | Gear | 0-3 | 3-10 | *[0-10]* | 10-20 | Foraging Area | Total CH |
| **AI** | Pollock | Trawl | 100% | 100% | *100%* | 100% | 100% | 100% |
| | Pacific Cod | Trawl | 100% | 51% | *57%* | 4% | 100% | 25% |
| | | Pot | 100% | 58% | *63%* | 18% | 100% | 36% |
| | | Longline | 100% | 58% | *63%* | 18% | 100% | 36% |
| | Atka Mackerel | Trawl | 100% | 75% | *78%* | 45% | 100% | 58% |
| **EBS** | Pollock | Trawl | 100% | 92% | *93%* | 60% | 45% | 58% |
| | Pacific Cod | Trawl | 100% | 92% | *93%* | 60% | 45% | 58% |
| | | Pot | 100% | 63% | *67%* | 60% | 45% | 54% |
| | | Longline | 100% | 61% | *65%* | 57% | 44% | 52% |
| | Atka Mackerel | Trawl | 100% | 100% | *100%* | 100% | 45% | 73% |
| **GOA** | Pollock | Trawl | 100% | 83% | *85%* | 48% | 0% | 57% |
| | Pacific Cod | Trawl | 100% | 83% | *85%* | 48% | 0% | 57% |
| | | Pot | 58% | 29% | *32%* | 27% | 0% | 27% |
| | | Longline | 58% | 29% | *32%* | 16% | 0% | 20% |
| **BSAI/GOA** | Pollock | Trawl | 100% | 90% | *91%* | 69% | 39% | 70% |
| | Pacific Cod | Trawl | 100% | 73% | *76%* | 36% | 39% | 48% |
| | | Pot | 78% | 44% | *48%* | 31% | 39% | 38% |
| | | Longline | 78% | 44% | *48%* | 25% | 38% | 34% |
| | Atka Mackerel (BSAI) | Trawl | 100% | 83% | *85%* | 66% | 48% | 66% |

Table 15. Time series of ABC, TAC, and total catch for Aleutian Islands Region walleye pollock fisheries 1991-2005. Units are in metric tons. Note: There was no OFL level set in 1991 and the 1993 harvest specifications were not available

| YEAR | ABC | TAC | OFL | CATCH | CATCH/TAC |
|---|---|---|---|---|---|
| 1991 | 101,460 | 72,250 | NA | 98,604 | 136% |
| 1992 | 51,600 | 47,730 | 62,400 | 52,352 | 110% |
| 1993 | | | | 57,132 | |
| 1994 | 56,600 | 56,600 | 60,400 | 58,659 | 104% |
| 1995 | 56,600 | 56,600 | 60,400 | 64,925 | 115% |
| 1996 | 35,600 | 35,600 | 47,000 | 29,062 | 82% |
| 1997 | 28,000 | 28,000 | 38,000 | 25,940 | 93% |
| 1998 | 23,800 | 23,800 | 31,700 | 23,822 | 100% |
| 1999 | 23,800 | 2,000 | 31,700 | 1,010 | 51% |
| 2000 | 23,800 | 2,000 | 31,700 | 1,244 | 62% |
| 2001 | 23,800 | 2,000 | 31,700 | 824 | 41% |
| 2002 | 23,800 | 1,000 | 31,700 | 1,156 | 116% |
| 2003 | 39,400 | 1,000 | 52,600 | 1,653 | 165% |
| 2004 | 39,400 | 1,000 | 52,600 | 1,150 | 115% |
| 2005 | 29,400 | 19,000 | 39,100 | 1,556 | 8% |

Table 16. Estimates of walleye pollock catches from the entire Aleutian Islands Region by source, 1977-2003. Units are in metric tons.

| Year | Official Foreign & JV Blend | Domestic Blend | Foreign Reported | NMFS Observer Data | Current estimates |
|---|---|---|---|---|---|
| 1977 | 7,367 | | 7,827 | 5 | 7,367 |
| 1978 | 6,283 | | 6,283 | 234 | 6,283 |
| 1979 | 9,446 | | 9,505 | 58 | 9,446 |
| 1980 | 58,157 | | 58,477 | 883 | 58,157 |
| 1981 | 55,517 | | 57,056 | 2,679 | 55,517 |
| 1982 | 57,753 | | 62,624 | 11,847 | 57,753 |
| 1983 | 59,021 | | 44,544 | 12,429 | 59,021 |
| 1984 | 77,595 | | 67,103 | 48,538 | 77,595 |
| 1985 | 58,147 | | 48,733 | 43,844 | 58,147 |
| 1986 | 45,439 | | 14,392 | 29,464 | 45,439 |
| 1987 | 28,471 | | | 17,944 | 28,471 |
| 1988 | 41,203 | | | 21,987 | 41,203 |
| 1989 | 10,569 | | | 5,316 | 10,569 |
| 1990 | | 79,025 | | 51,137 | 79,025 |
| 1991 | | 98,604 | | 20,493 | 98,604 |
| 1992 | | 52,352 | | 20,853 | 52,352 |
| 1993 | | 57,132 | | 22,804 | 57,132 |
| 1994 | | 58,659 | | 37,707 | 58,659 |
| 1995 | | 64,925 | | 18,023 | 64,925 |
| 1996 | | 29,062 | | 5,982 | 29,062 |
| 1997 | | 25,940 | | 5,580 | 25,940 |
| 1998 | | 23,822 | | 1,882 | 23,822 |
| 1999 | | 1,010 | | 24 | 1,010 |
| 2000 | | 1,244 | | 75 | 1,244 |
| 2001 | | 824 | | 88 | 824 |
| 2002 | | 1,156 | | 144 | 1,156 |
| 2003 | | 1,653 | | | 1,653 |
| 2004 | | 1,150 | | | 1,150 |
| 2005 | | 1,610 | | | 1,610 |

Table 17. Estimates of Aleutian Islands Region walleye pollock catch by the three management sub-areas. Foreign reported data were used from 1977-1984, from 1985-2003 observer data were used to partition catches among the areas. Units are in metric tons.

| Year | East (541) | Central (542) | West (543) | Total |
|---|---|---|---|---|
| 1977 | 4,402 | 0 | 2,965 | 7,367 |
| 1978 | 5,267 | 712 | 305 | 6,283 |
| 1979 | 1,488 | 1,756 | 6,203 | 9,446 |
| 1980 | 28,284 | 7,097 | 22,775 | 58,157 |
| 1981 | 43,461 | 10,074 | 1,982 | 55,517 |
| 1982 | 54,173 | 1,205 | 2,376 | 57,753 |
| 1983 | 56,577 | 1,250 | 1,194 | 59,021 |
| 1984 | 64,172 | 5,760 | 7,663 | 77,595 |
| 1985 | 19,885 | 38,163 | 100 | 58,147 |
| 1986 | 38,361 | 7,078 | 0 | 45,439 |
| 1987 | 28,086 | 386 | 0 | 28,471 |
| 1988 | 40,685 | 517 | 0 | 41,203 |
| 1989 | 10,569 | 0 | 0 | 10,569 |
| 1990 | 69,170 | 9,425 | 430 | 79,025 |
| 1991 | 98,032 | 561 | 11 | 98,604 |
| 1992 | 52,140 | 206 | 6 | 52,352 |
| 1993 | 54,512 | 2,536 | 83 | 57,132 |
| 1994 | 58,091 | 554 | 15 | 58,659 |
| 1995 | 28,109 | 36,714 | 102 | 64,925 |
| 1996 | 9,226 | 19,574 | 261 | 29,062 |
| 1997 | 8,110 | 16,799 | 1,031 | 25,940 |
| 1998 | 1,837 | 3,858 | 18,127 | 23,822 |
| 1999 | 484 | 420 | 105 | 1,010 |
| 2000 | 615 | 461 | 169 | 1,244 |
| 2001 | 332 | 386 | 105 | 824 |
| 2002 | 842 | 180 | 133 | 1,156 |
| 2003 | 569 | 758 | 326 | 1,653 |

Figure 1. Kanaga sound site. The Kanaga Sound site is waters within the study area delineated by a box with the northern boundary of 52° 15' latitude and a southern boundary of 51° 43' latitude from Adak Island to the eastern shore of Tanaga Island. The eastern boundary is 176° 45' longitude W and the western boundary is 178° 15' longitude W south to 51° 52' N latitude. The southern boundary of this portion of the box on the west side of Tanaga Island is at 51° 52' N latitude between 178° 15' longitude W and 178° 13' 22" longitude W. This area is located within statistical area 542 of the BSAI.

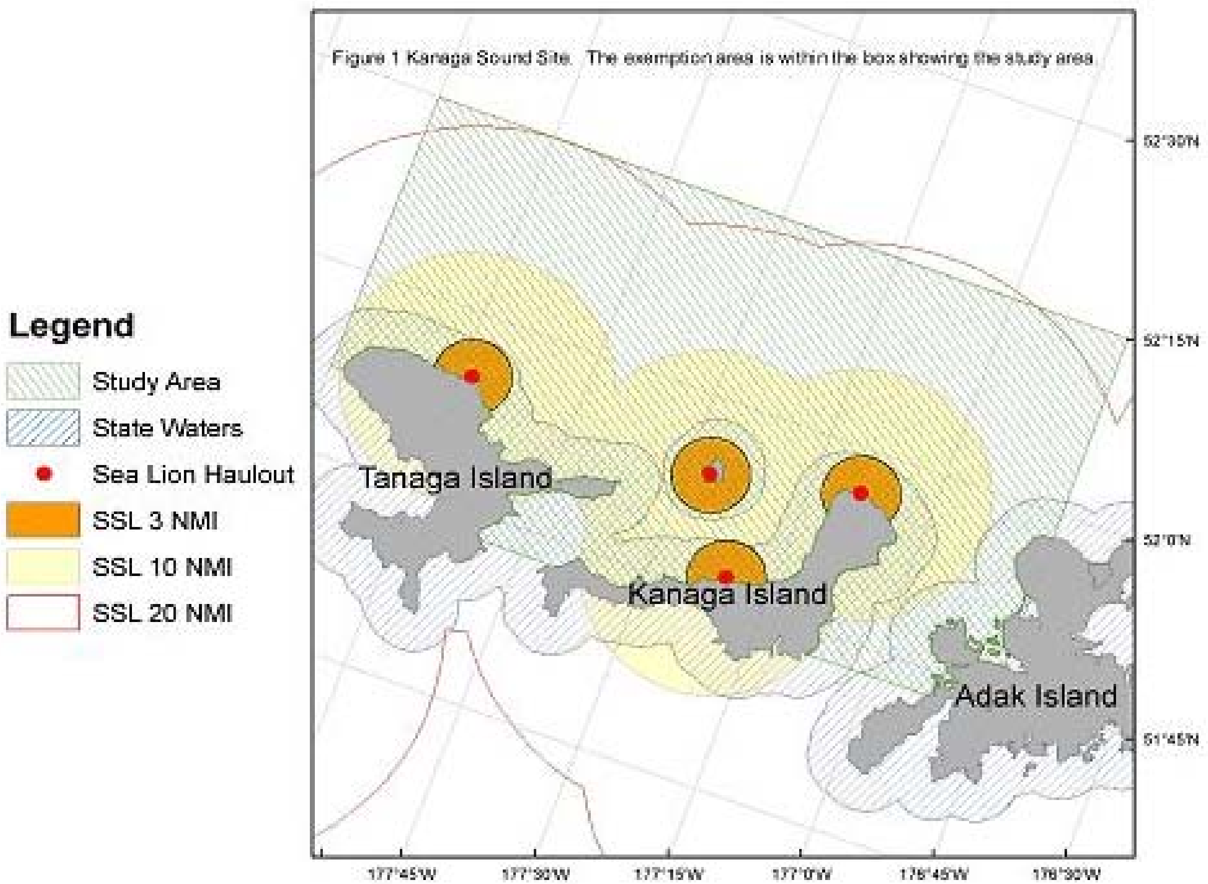


Figure 2. Atka Island site. The Atka Island site is waters north of Atka and Amlia Island between 173°30' W longitude and 175°15' W longitude and south of 52°45' N latitude. At Amlia pass, the area includes waters north of a line at 52 deg. 7' 30" North latitude between 174 deg. 3' W longitude and 174deg. 5' 1" W longitude. This area is located in statistical area 541 of the BSAI.

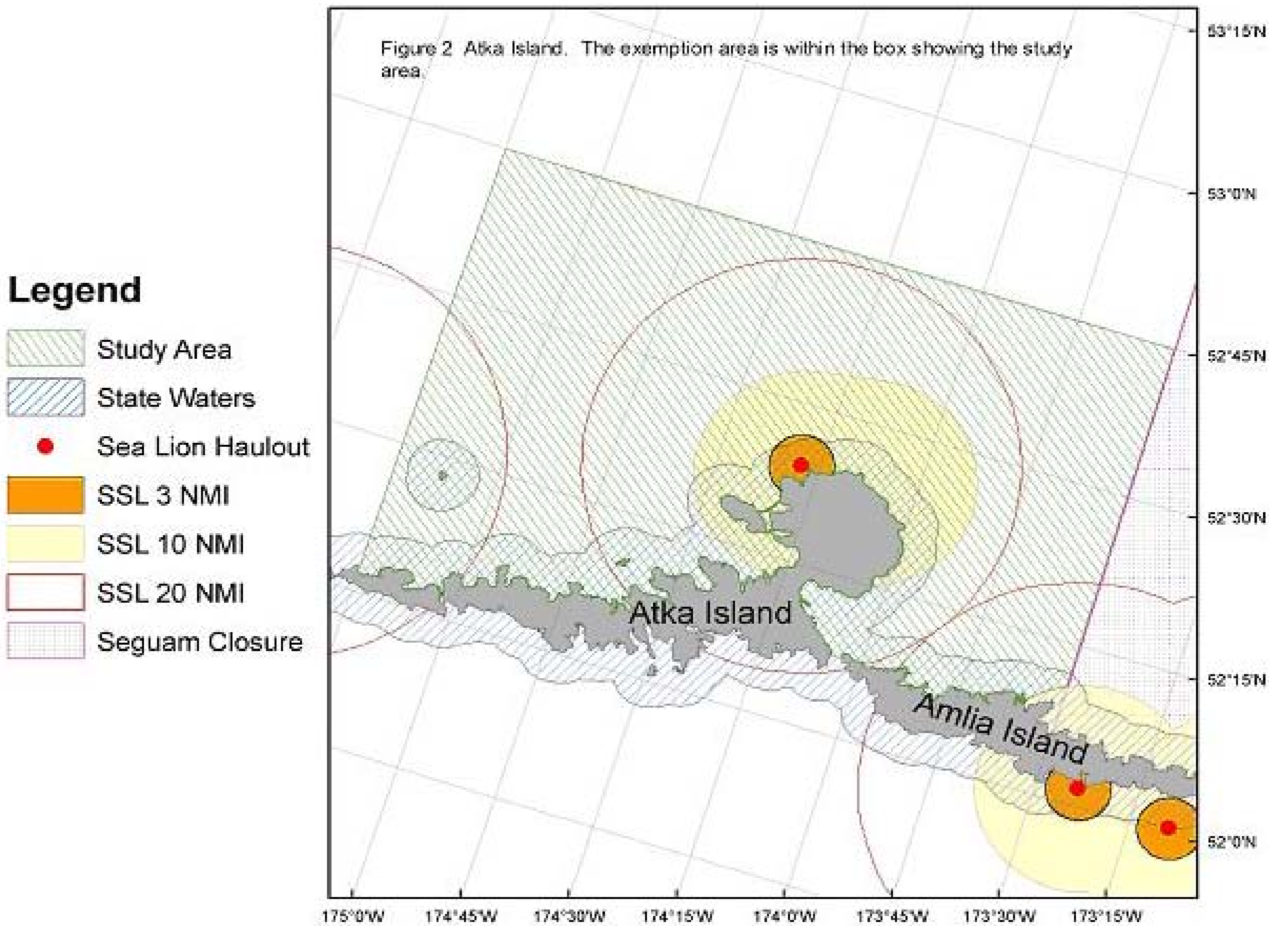


Figure 3. Designated critical habitat for the western population of Steller sea lion in Alaska. 50 CFR 226.202

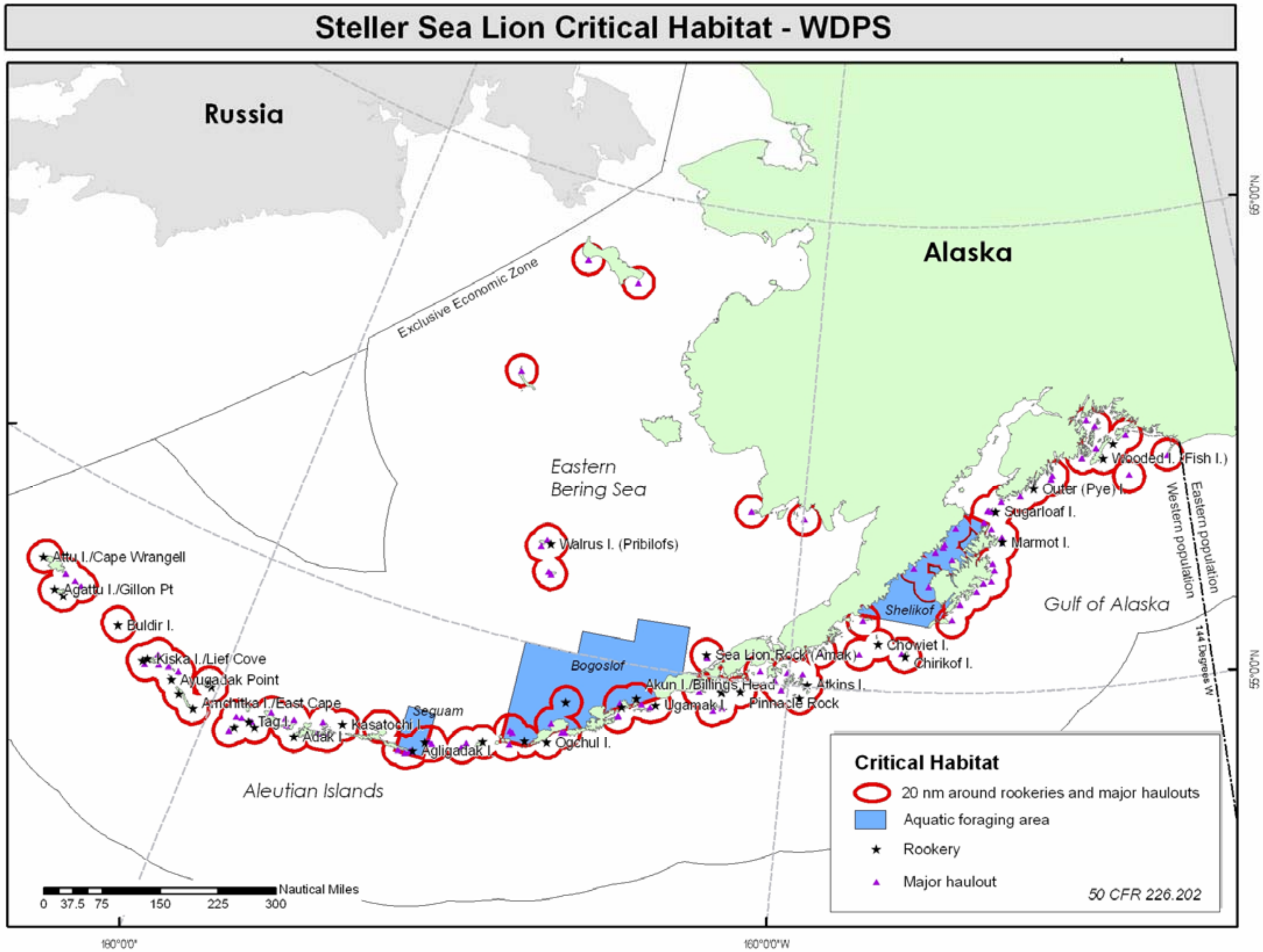


Figure 4. Steller sea lion survey regions from Dixon Entrance to Attu Island and the location of the principal rookeries in Alaska. Kiska Island, the Kenai Peninisula, and Walrus Island in the eastern Bering Sea are also noted, along with the boundary between the breeding ranges of the eastern and western sea lion stocks. The Central Aleutian Islands is defined as the area between Samalga Pass and Kiska Island.

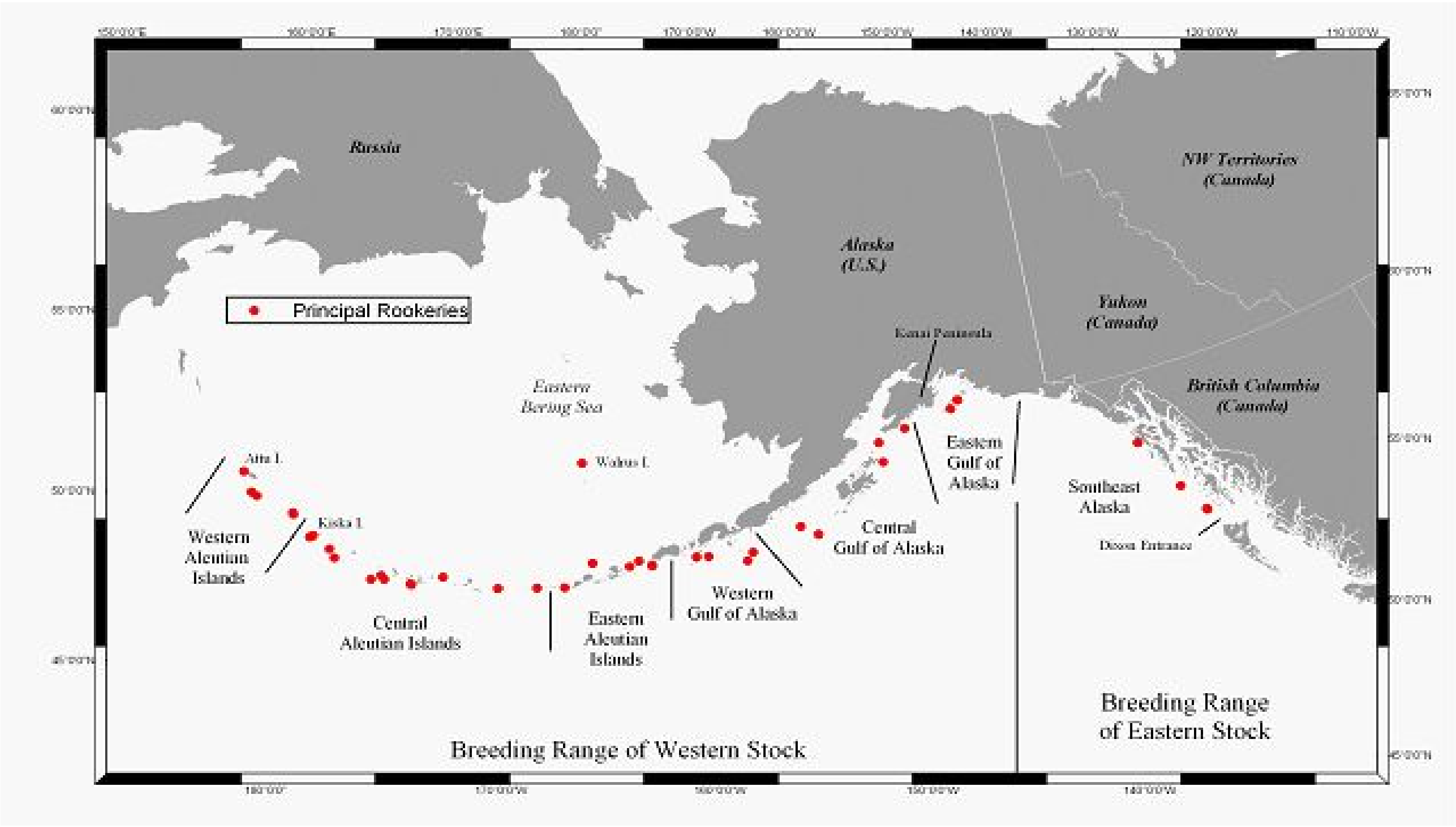


Figure 5. Breeding ranges of the western and eastern stocks of Steller sea lions (triangles = terrestrial locations of major rookeries) in the North Pacific.

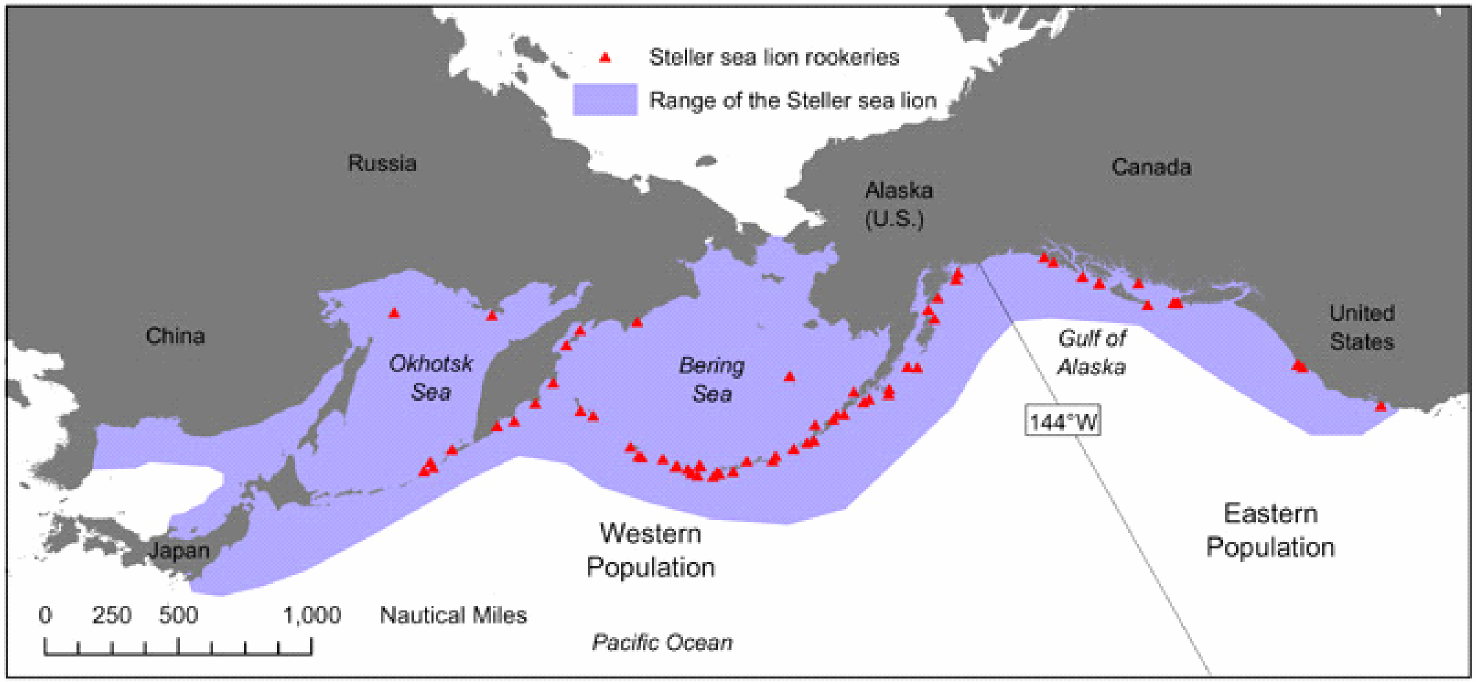
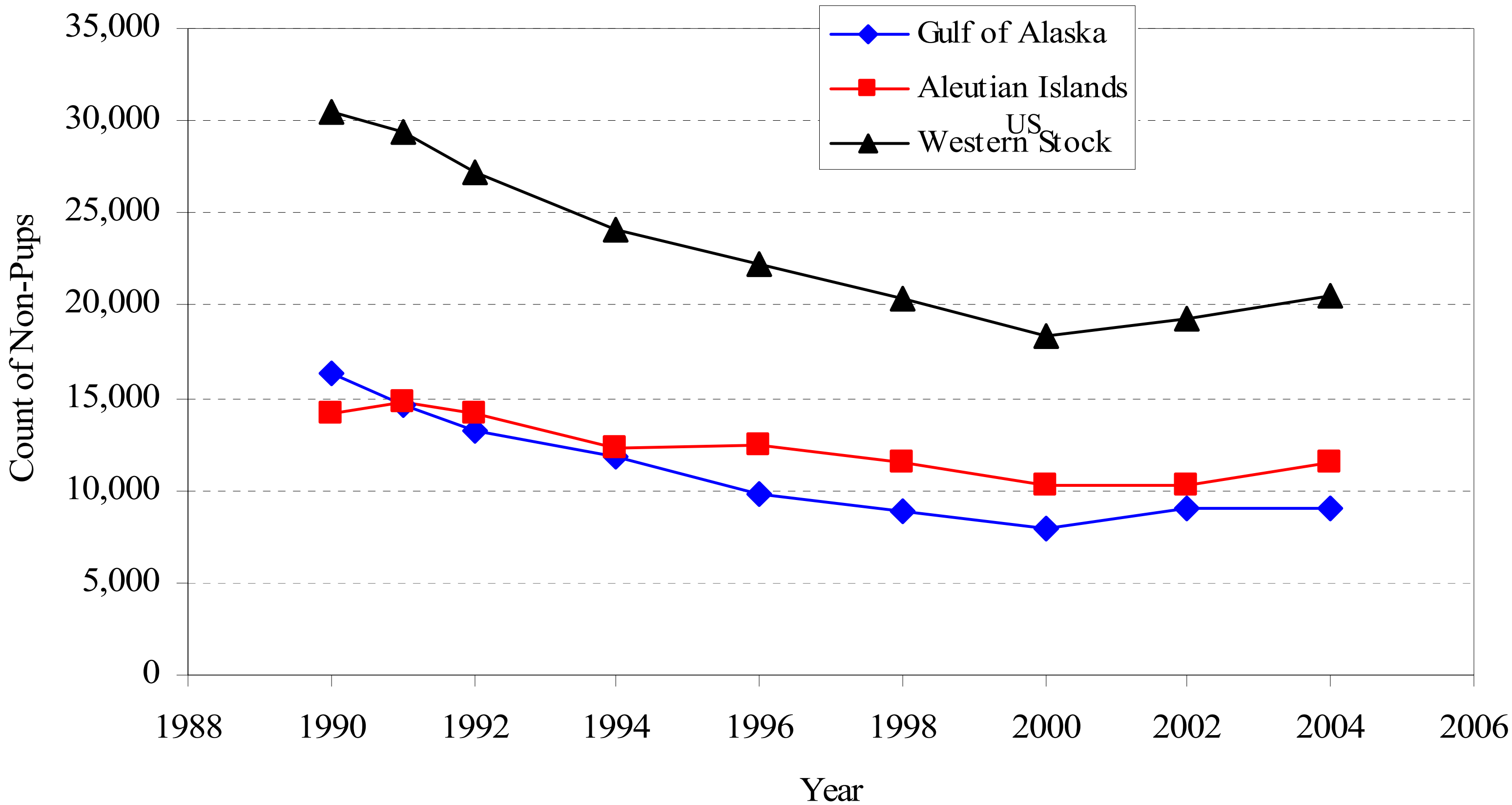


Figure 6.  Counts of non-pups in the western population.



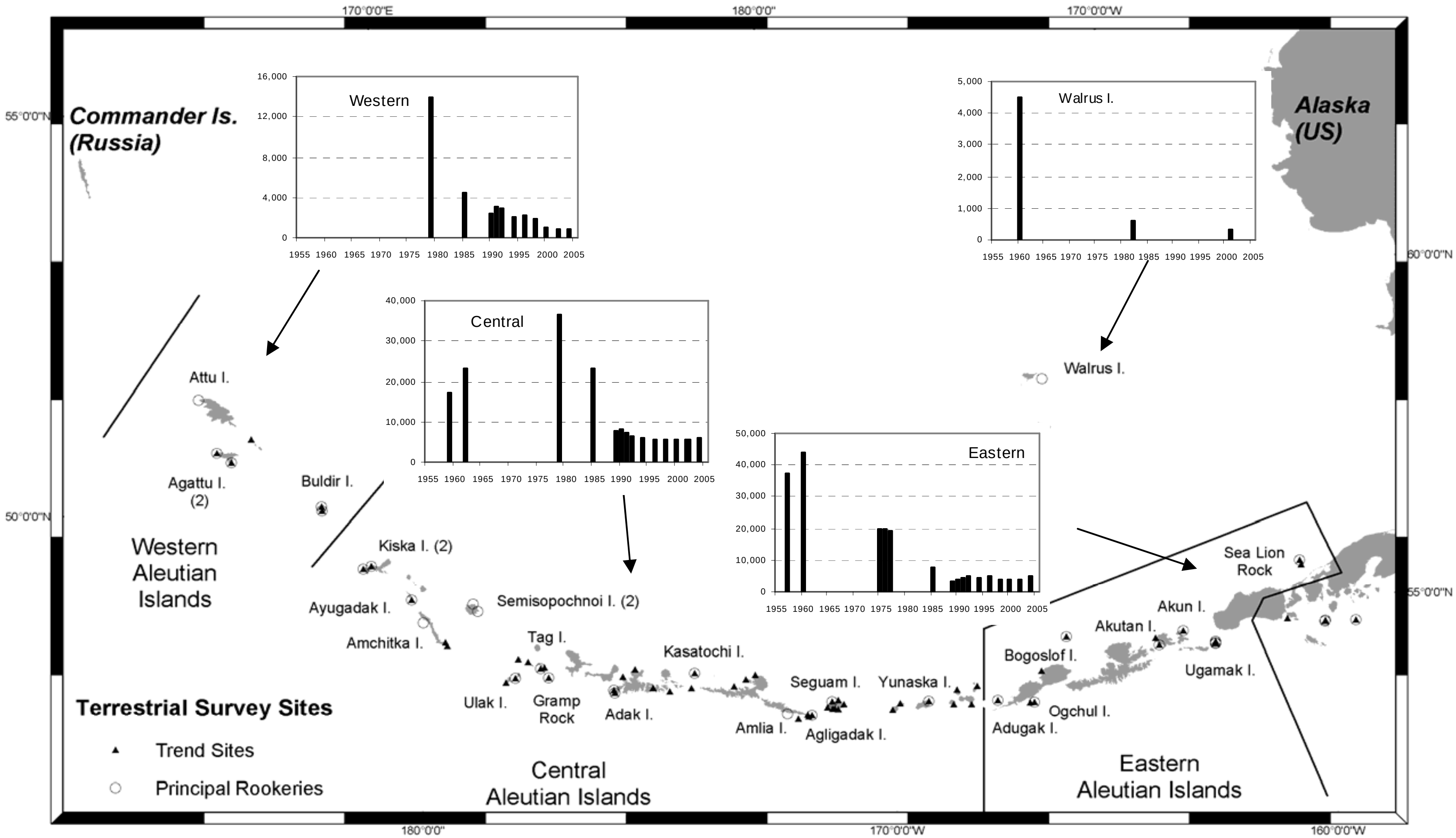



Figure 7. Counts of adult and juvenile Steller sea lions on western population trend sites in three sub-areas of the Aleutian Islands, 1950s through 2004. Counts on Walrus Island in the eastern Bering Sea are also shown, as are the location of principal rookeries (named) and major terrestrial haulout trend sites (NMFS 1992; Fritz and Stinchcomb 2005).

Figure 8. Steller sea lion pup counts at trend rookeries in the range of the western stock in Alaska by region from the late 1980s to 2005 in the Gulf of Alaska (A) and Aleutian Islands (B). Percent change in counts between 1990/92 and 2001/02 (C) and 2001/02 and 2005 (D) are also shown (data from Table 2).

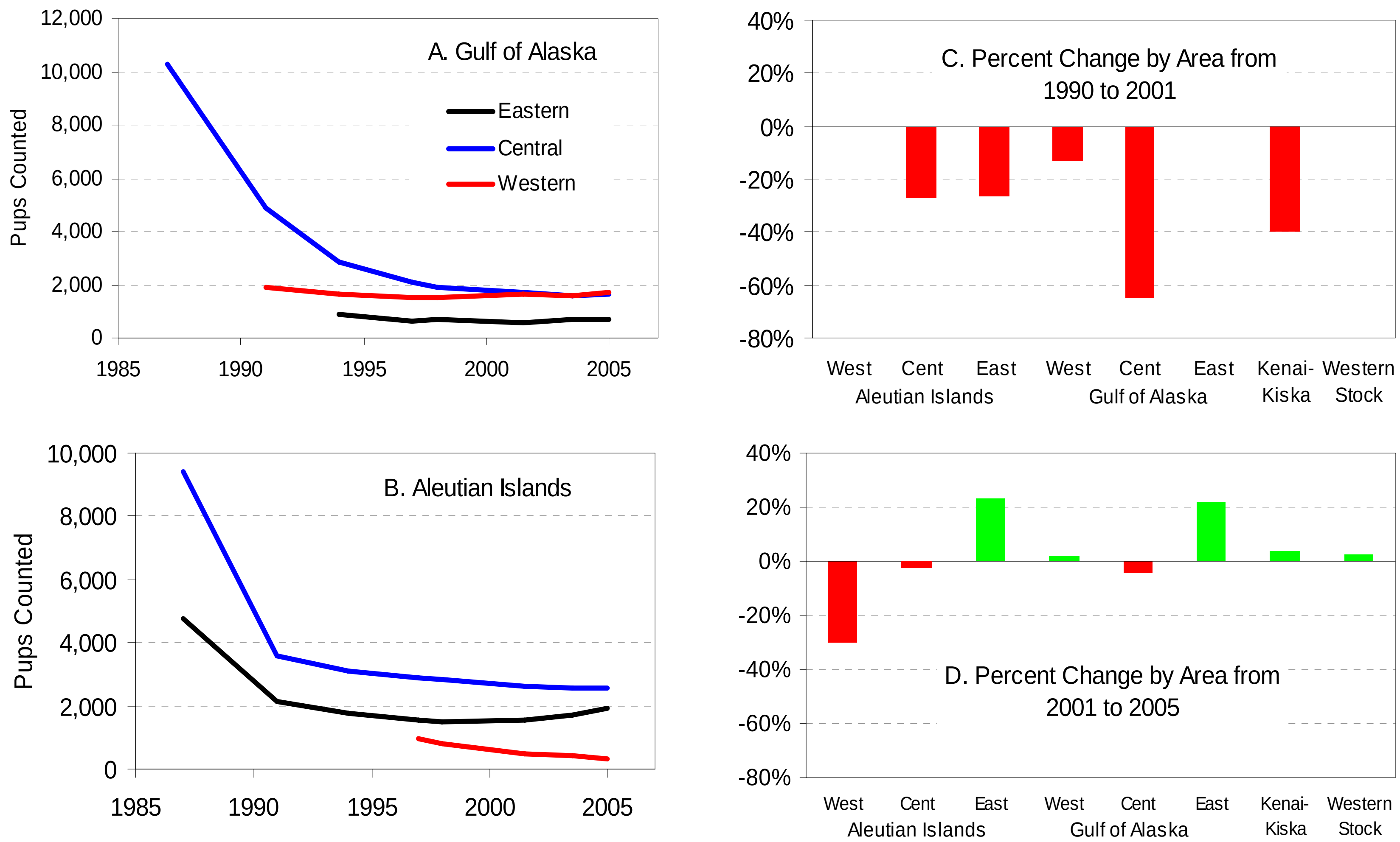
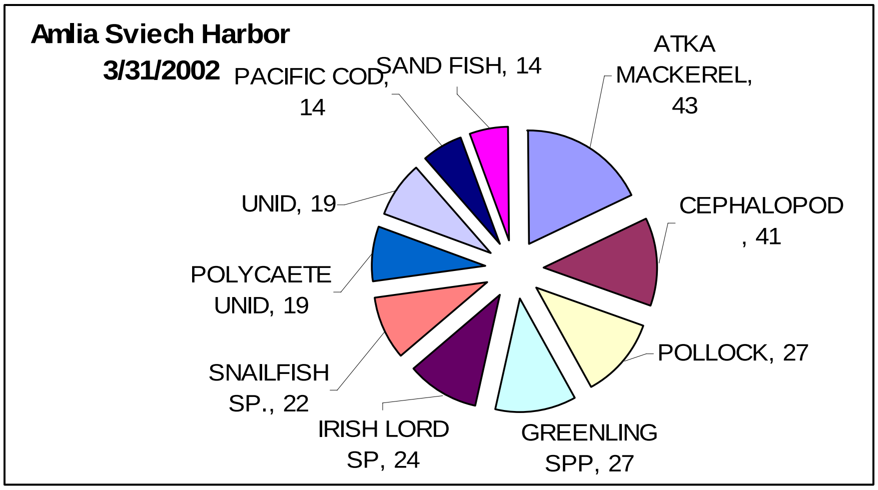
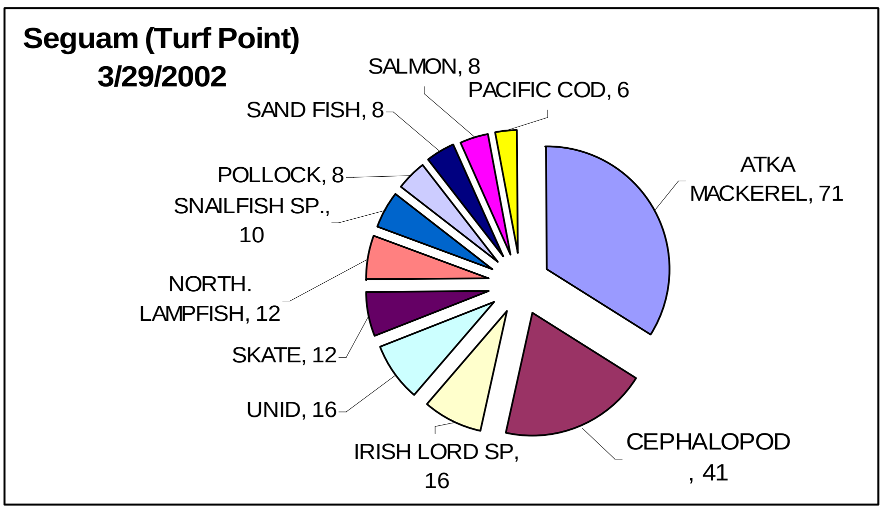
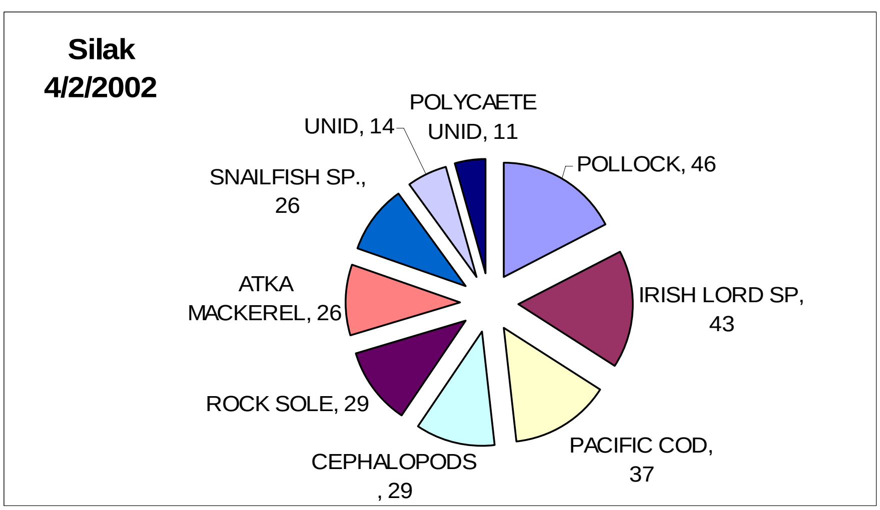


Figure 9. Frequency of occurrence of various prey items in scat as described in Table 6.



FIGURES

Figure 12. Harvest of pollock in the Aleutian Islands area from 1989-2003 (NMFS unpublished data).

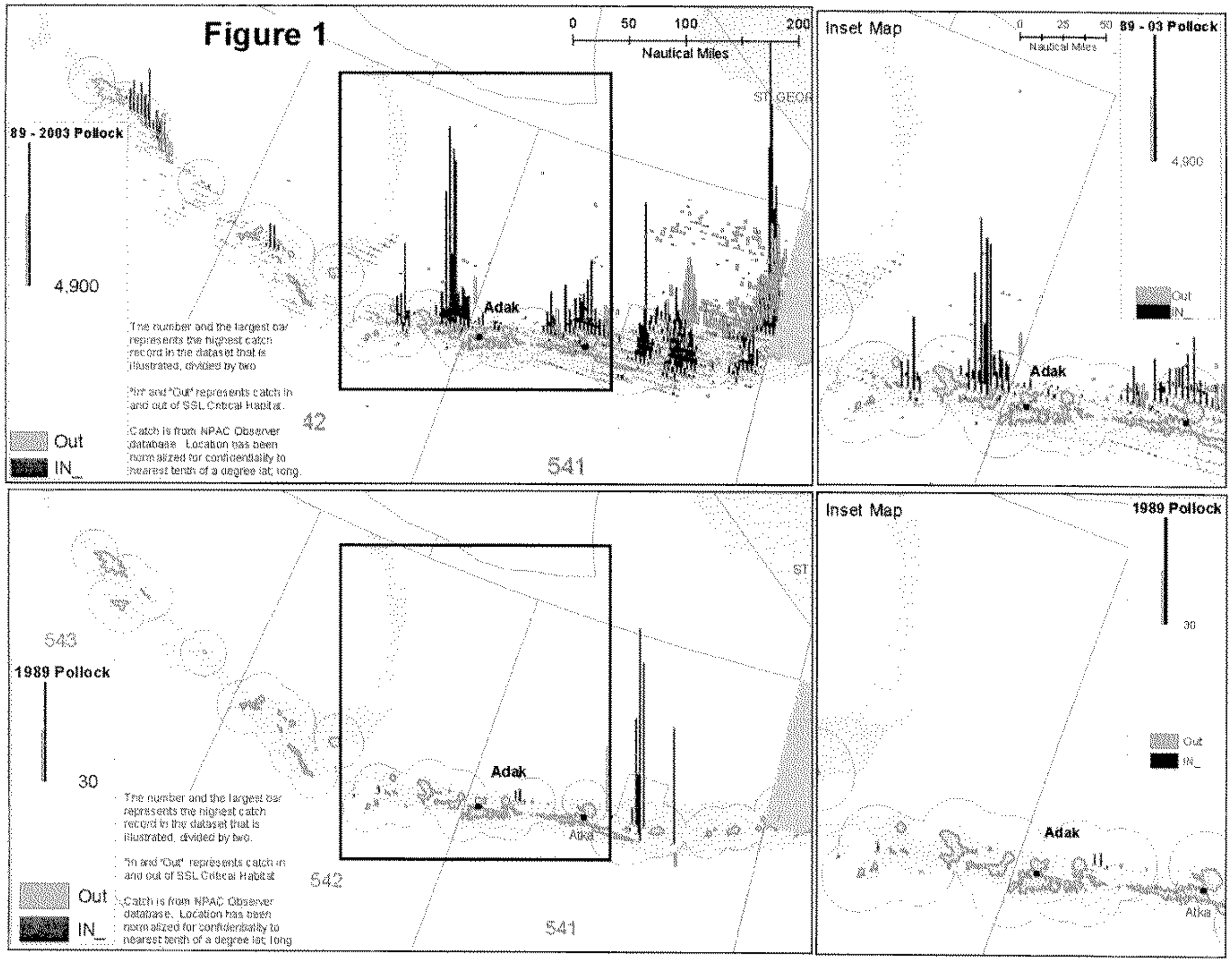


Figure 10. Fraction of critical habitat in the Aleutian Islands area closed to pollock fishing.

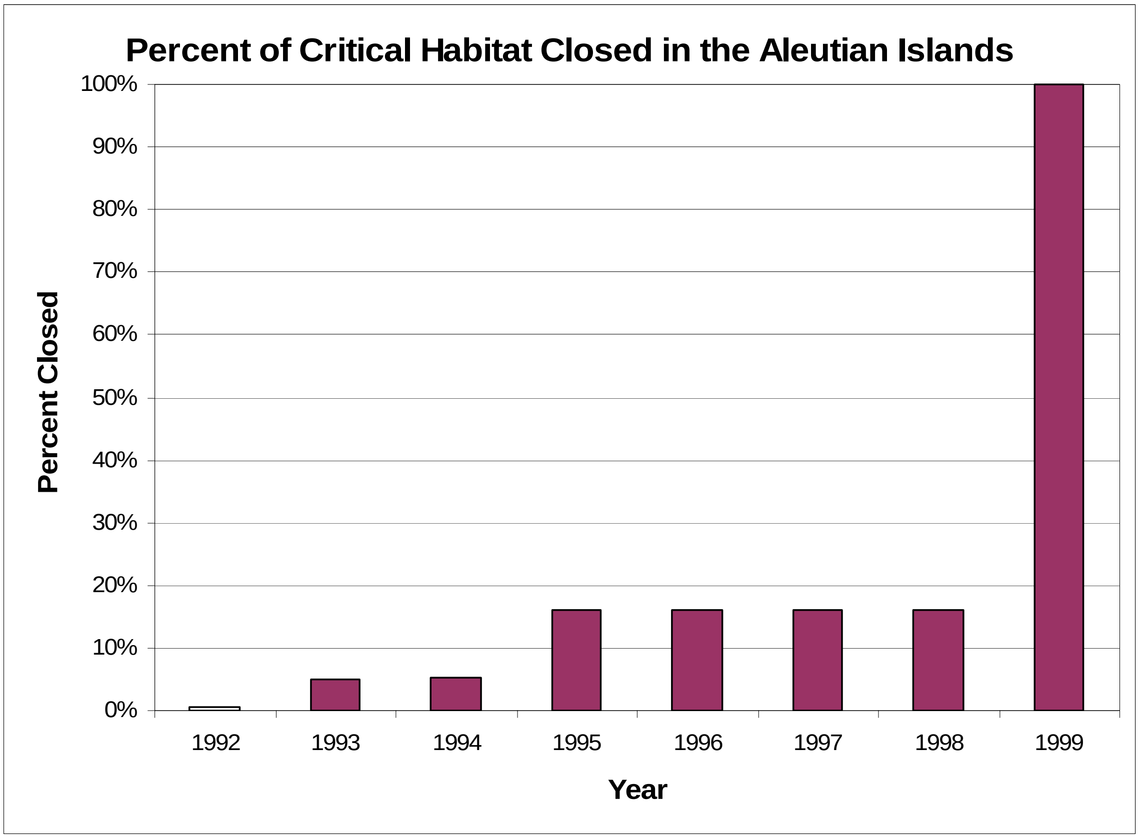


Figure 11. Observed foreign and J.V. (1978-1989), and domestic (1989-2002) pollock catch in the Aleutian Islands Area summed over all years and 10 minute latitude and longitude blocks. Both maps use the same scale (maximum observed catch per 10 minute block: foreign and J.V. 8,000 t and Domestic 19,000 t). Catches of less than 1 t were excluded from cumulative totals. (from Barbeaux et al. 2005.

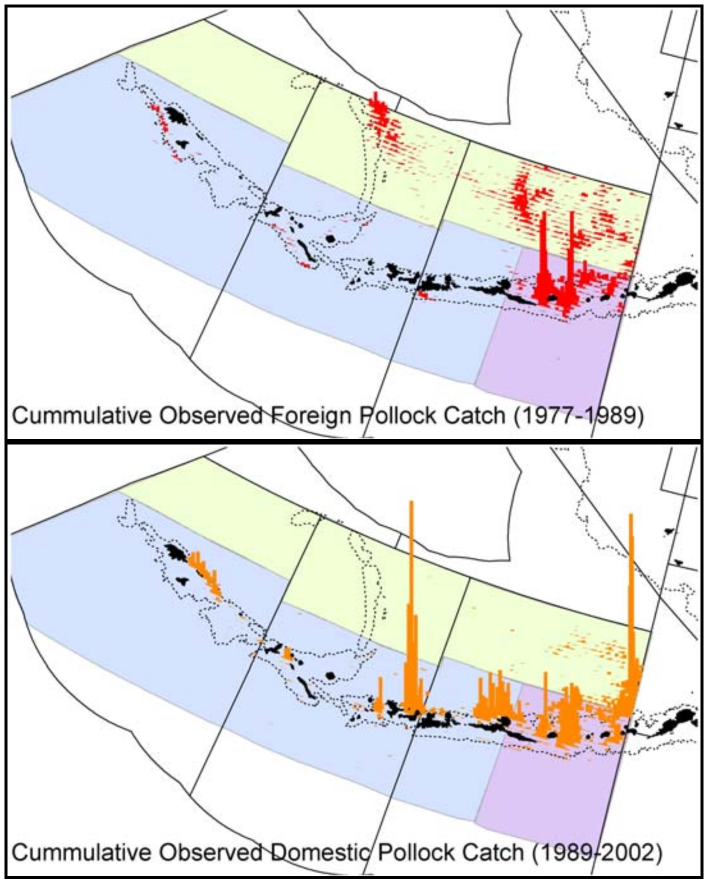


Figure 13. Model1(top) and Model 2 (bottom) estimates of Aleutian Islands pollock age 2+ total biomass (in tons); dashed lines represent approximate upper and lower confidence bounds (from Barbeaux et al 2005).